



JHE

JOURNAL OF HOME ECONOMICS, MENOUFIA UNIVERSITY

Website: <https://mkas.journals.ekb.eg>

Print ISSN
2735-5934

Online ISSN
2735-590X

Nutrition and Food Sciences
Article Type: Original article

Received: 5 Feb 2025
Accepted: 16 Mar 2025
Published: 1 Apr 2025

The Effect of Dietary Intervention with Pomegranate and Aloe Vera in Alleviating the Symptoms of Alcohol-Induced Stomach Ulcers in Experimental Rats

Mai Gharib, Mona Zaid, Seham Khader

Department of Nutrition and Food Sciences, Faculty of Home Economics,
Menoufia University, Shibin El Kom, Egypt

*Corresponding author: Mai Gharib, e-mail: mai.ghareb@hec.menofia.edu.eg

ABSTRACT:

Peptic

ulcer disease is defined by open lesions in the stomach and duodenum, frequently associated with oxidative stress and inflammation. This study evaluated the therapeutic potential of a probiotic functional formula enriched with pomegranate peel extract and aloe vera gel. Thirty-five adult male rats were allocated into a negative control group (n=7 rat) and ulcer-induced groups (n=28 rat), which received a single oral dose of ethyl alcohol at a concentration of 10 ml/kg. The ulcer-induced groups were further categorized into four equal subgroups, each receiving distinct treatments: 200 mg/kg of aloe vera (AVG), 50 mg/kg of pomegranate (PMG), and a combined treatment of aloe vera and pomegranate (APG). The results indicated that the dietary interventions significantly improved hematological and antioxidant parameters. Notably, the APG group demonstrated the highest hemoglobin level (12.25 ± 0.70 g/dl) and red blood cell (RBC) count (7.03 ± 0.59), representing a substantial enhancement compared to the ulcer-induced control group. Additionally, antioxidant activity was markedly enhanced, with the APG group exhibiting the highest superoxide dismutase (SOD) level (25.03 ± 0.55 u/ml) and lower malondialdehyde (MDA) levels (1.54 ± 0.53 nmol/ml). Furthermore, the ulcer inhibition index was highest in the APG group (359.71 ± 44.14), which also recorded the greatest protection rate ($60.17 \pm 5.24\%$) and the lowest ulceration percentage ($35.87 \pm 5.89\%$). These findings underscore the synergistic protective effects of aloe vera and pomegranate in mitigating gastric damage, enhancing antioxidant defenses, and promoting ulcer healing. The combined treatment exhibited significant therapeutic benefits, suggesting its potential as a natural approach for alleviating peptic ulcers and improving overall gastrointestinal health.

Keywords: Gastric, Prebiotic, Antioxidant, Inflammation, Protective index, Ulcer score

Cite as: Gharib et al., 2025, The effect of dietary intervention with pomegranate and aloe vera in alleviating the symptoms of alcohol-induced stomach ulcers in experimental rats. JHE, 35 (2), 57-84. DOI: [10.21608/mkas.2025.365849.1373](https://doi.org/10.21608/mkas.2025.365849.1373)

1. INTRODUCTION

Peptic ulcer disease (PUD) is a type of gastrointestinal ulcer that develops on the stomach lining or the upper portion of the

small intestine and is linked to damage in the gastric mucosa and submucosa of the stomach and duodenum. It happens when there is an imbalance between defensive elements like gastric mucus and antioxidant defenses and

aggressive elements like stomach acid and free radicals. Inflammation and oxidative stress are the two main processes behind stomach ulcers. [1].

To eradicate peptic ulcers, ongoing development into more effective antiulcerogenic medications is crucial, depending on availability and cost. According to research, a variety of fruits and vegetables have anti-inflammatory, antioxidant, anti-secretory, antibacterial, anticholinergic, and cellular defense mechanisms that can prevent peptic ulcers. Furthermore, the phytochemicals included in fruits and vegetables are essential for both illness prevention and therapy. [2].

As a result, research was conducted on aloe vera, another readily available tropical plant that may help those who suffer from ulcers. The Arabic word "Alloeh" means "shining bitter substance," and the Latin word "vera" means "true." These are the origins of aloe vera. Aloe was known to the Egyptians as "the plant of immortality." For millennia, aloe plants have been utilized as medicine. One of the most popular medicinal plants in human history is *Aloe barbadensis* (1,8-Dihydroxy-3-hydroxymethyl-10-(6-hydroxymethyl)-3,4,5-trihydroxy-2-pyranyl anthrone), often known as aloe vera. [3]

Aloe Vera is a small, stemless plant that grows between 60 and 100 cm in height. Varieties with white spines have green, thick, meaty leaves [4]. The blooms, which are 90 cm tall pendulums with yellow tubular corollas, are mostly produced in the summer. The phytochemical makeup consists of lectins, anthrones, and anthraquinone c-glycosides. It has been discovered that giving aloe vera within seven days caused the stomach ulcer to heal. There is a reduction in the stomach acid production particularly in the high dose group as compared with the omeprazole group, in line with the prior study in acid output reduction [5]. Prostaglandins, fatty and amino acids, are thought to be the mechanism of action of acid reduction [6]. The small rise in

stomach acid production in the Aloe vera treatment group may be explained by the tendency of amino acids in protein to raise hydrochloric acid levels to convert inactive pepsinogen to pepsin. Gibberellin, auxins, and fatty acids have also been discovered to be present in aloe vera [7]. Auxin and gibberellin promote wound healing, while fatty acids raise prostaglandin levels, which control inflammation. In contrast to its high dosage, aloe vera reduces acid output with increased use, as seen on day 28. It indicates that, as was shown in the earlier work using a tropical plant, a periodic rise improves prostaglandin production for mucus protective manufacture [8]. From day 7 to day 28 of the trial, it was demonstrated that prostaglandin levels rose, which aided in the gastric ulcer's healing. This suggests that during the healing process, strong herbal treatments enhance the prostaglandin rise pathway through the production of fatty acids. In ancient folk medicine, pomegranates (*Punica granatum*) were used to prevent or treat a variety of stomach and intestinal disorders. Numerous active substances, including flavonoids (catechins and quercetin), phenolic compounds (gallagic acid), and anthocyanidin (cyanidin), were present in all regions of pomegranates [9]. They have been shown to have a variety of biological benefits, including anti-inflammatory, antioxidant, antibacterial, and antiulcer properties [10]. Pomegranate peel (PP) is the inedible film layer inside the pomegranate and its outermost hard structure. It is a by-product of pomegranate products manufacturing. It makes up roughly 30% to 40% of the entire pomegranate and is typically thrown away as waste [11]. Because of its abundance of polyphenols, pomegranate peel extract (PPE) has garnered a lot of interest [12]. Talaat et al. [13] and Chauhan et al. [14] revealed that pomegranate peel aqueous or ethanol extracts had a gastro-protective effect against either Ethier or aspirin-induced gastric ulcer model in rats, indicating that the tannin level

in PP can range from 10.4% to 21.3%. Ifora et al. [15] found that in rats with ethanol-induced stomach ulcers, pomegranate rind extracts reduced inflammation by suppressing the expression of the cyclooxygenase-2 protein. Probiotics are live bacteria that help the host's health when taken in sufficient quantities. One of the most well-known sources of probiotics is yogurt, which contains *Bifidobacterium* and *Lactobacillus* strains. By encouraging the growth of good bacteria and suppressing bad bacteria, these probiotics aid in preserving a balanced gut microbiota [16].

It is well known that probiotics lessen intestinal inflammation. One of the main causes of ulcer development and delayed healing is inflammation. Probiotics have the potential to improve ulcer healing rates by reducing stomach lining inflammation through immune response modulation. According to research, probiotics may help ulcers heal by boosting growth factor production and enhancing blood flow to the afflicted areas. This can hasten the healing process for ulcer sufferers [17].

The goal of nutritional therapy is to encourage recovery through a complicated series of steps that start with the original trauma and end with the repair of the injured tissue. Its antioxidant, anti-inflammatory, mucus-secreting, cytoprotective, or healing properties may help explain its anti-ulcer properties [3]. Therefore, the purpose of this investigation was to determine the anti-ulcer effects of functional probiotic formulas containing pomegranate and aloe Vera on peptic ulcer induced albino rats.

2. MATERIALS AND METHODS

2.1 Materials

The fresh pomegranate and aloe vera were gathered from Shibin El-Kom Supermarket in the Menoufia Governorate of Egypt.

Adult male white albino rats were purchased from the Medical Analysis Department of the

Research Institute of Ophthalmology in Giza, Egypt.

Cellulose, casein, and a blend of vitamins and minerals were bought from Morgan Co. in Cairo, Egypt.

The other chemicals used in the experiment, including formalin, ethanol, and EDTA were supplied from El-Nasr Pharmaceutical Chemicals, El-Amieria, Cairo, Egypt.

2.2 Methods

2.2.1 Preparation of aqueous extract of Aloe vera:

Aloe vera L. whole fresh leaves were recognized by a botanist at Menoufia University's Agriculture College in Egypt after being removed from a locally available plant. After thoroughly washing whole aloe vera leaves in lots of water, the gel was removed, combined with distilled water, and shaken. After that, the preparation was filtered out and combined with yogurt to create Formula 1 [18].

2.2.2 Preparation of aqueous pomegranate peel extract

The pomegranate peel was removed and stored at 4 °C in a refrigerator. After being cleaned, the peels were cut into tiny pieces and processed in a grinder. The extract was then made in water with a solvent ratio of 1:50 and heated to 80 °C for 30 minutes [19]. In the rotary vacuum evaporator, the extracted material was cooled, filtered, and concentrated at 60°C and 20 rpm until the volume was reduced to 4/5 of the total extract [20]. The concentrated extract was kept in a dark, airtight plastic bottle at -18 °C. [21].

2.2.3 Preparation of yogurt

At Menoufia University's Faculty of Agriculture, yogurt was produced. Dairy Laboratory uses plain Dannon® yogurt with *Lactobacillus* and *Bifidobacteria* species at pH 4.5 to 4.8 as a fermentation starter. 20% of the cultured yogurt was solid..

2.2.4 Induction of gastric ulcer:

For two hours, the rats in the experimental and positive control groups were given a single oral dosage of ethyl alcohol (10 ml/kg body weight) to cause stomach ulcers [22].

2.2.5 Assessment of gastric mucosal injury

Histological sections were created by fixing stomach tissues in 10% formalin for a whole day in order to confirm the presence of peptic ulcers. Histological analysis of hemorrhagic regions in ulcer cases revealed that the stomach pits and surface epithelium were either absent or severely damaged, which led to the emergence of subepithelial capillaries. [23].

2.2.6 Experimental design

For seven days, 35 mature male white albino rats of the Sprague Dawley strain, weighing $150\text{g} \pm 5\text{ g}$. The rats were housed in wire cages that were cylindrical and had wire bottoms. In order to prevent food from being scattered, the diet was presented in special food containers. Additionally, the rats were given water by projecting a glass tube through the wire cage. The rats were lived in animal quarters with regulated humidity and temperature, a 12-hour light/dark cycle, and unrestricted access to food and water.

The experiment was carried out at the Biology Laboratory, Faculty of Home Economic, Menoufia University, Egypt.

For seven days, all rats were fed the basal diet, as described by the American Institute of Nutrition (AIN)[24].

Rats were divided into two main groups, the first group, known as the negative control group, consisted of seven normal rats who did not receive any intervention; and they were fed on basal diet and oral dose (5 ml/kg) of distilled water only.

The Second group (n=28 rat) is the gastric ulcer-induced rats that were randomly divided into four equal subgroups (7 rats):

Positive control group (PCG): include ulcerative gastric rats that were infected with

gastric ulcer and they were fed on basal diet and oral dose (5 ml/kg) of distilled water only. Aloe vera group (AvG): include ulcerative gastric rats that were treated with oral administration of formula 1 (Aloevera 200 mg/kg [18], in yogurt at dose 5 ml/kg [25].

Pomegranate group (PmG): include ulcerative gastric rats that were treated with oral administration of formula 2 (Pomegranate peel extract (50 mg/kg per day in yogurt at dose 5 ml/kg) [26].

Combined group (APG): ulcerative gastric rats were treated with oral administration of formula 3 (Aloe vera and pomegranate (1:1) in yogurt.

At the beginning of experiment, blood samples of the rats were tested to get the initial values before the dietary intervention.

At the end of experimental periods the rats from each group were fasted for 12 hours, then slaughtered and blood samples were collected from hepatic portal vein into a dry clean centrifuge tube. Blood samples were centrifuged at (4000 rpm) for ten minutes to separate blood serum, then kept in deep freezer till using.

2.2.7 Diets

Standard diet: The basal diet was made in accordance with AIN. [24].

2.2.8 Biological Evaluation:

Body weight gain (BWG), food intake (FI), and feed efficiency ratio (FER):

Throughout the trial, body weight was measured once a week and net food consumption was measured every day. The following is how feed efficiency ratios (FER) were calculated using net food intake and acquired body weight:

$$\text{FER \%} = \frac{\text{Body weight gain (g)}}{\text{Food intake (g)}} \times 100$$

2.2.9 Biochemical analysis

Using the techniques of A.O.A.C. [27], a sample of the prepared pomegranate and aloevera was taken to estimate its chemical

composition (moisture, protein, fat, ash, total sugars, some sugars, and polysaccharide).

The method used for the determination of total phenols using Folin-Ciocalteu reagent was adapted from [28]. To ascertain the sample's total flavonoid content, the aluminum chloride colorimetric method was employed, following the procedure outlined by Miliauskas et al. [29]

Assessment of antioxidant status: erythrocyte red blood cells' levels of Super Oxide Dismutase (SOD), Malondialdehyde (MDA), and Catalase (CAT) were measured using a spectrophotometer approach in accordance with Stroeve and Makarova [30].

Collection of gastric juice: Rats will be fasted for 12 hours at the end of the experiment, and all rats were sedated with diethyl ether two hours after ethyl alcohol is administered. Then the gastric juice was collected and centrifuged to examine the characteristics of gastric secretion.

Each stomach's contents were moved into a tube from the centrifuge tubes, and the tubes' contents were spun for ten minutes at 1000 rpm. The floating liquid was then moved to measuring cylinders to determine the volume. To measure the pH, one milliliter of gastric juice was collected, and a digital pH meter was used to take a direct reading [31].

Evaluation of Stomach ulceration degree

The ulcer score, which is determined by dividing the total number of ulcers in each group by the number of rats in that group, was used to express the degree of ulceration [32]. The ulcer score was multiplied by 100 to determine the ulcer index (UI) [33]. The preventative index was computed using the method of [34], and the ulceration (%) was computed by dividing the number of animals with ulcers by the total number of animals and multiplying by 100 [35]. The percentage protection was measured in equation (2): % Protection = (Ulcer Index) control – (Ulcer Index) test / (Ulcer Index) control × 100. The severity of ulcers was classified as described, Normal coloured stomach: 0; Red colouration

: 0.5; Spot ulcer: 1; Hemorrhagic streaks: 1.5; Ulcers ≥ 3 but ≤ 5 ; Severe ulcers >5 : 3.

The histological characteristics of gastric lesions were examined under a microscope by preserving stomach tissues in 10% formalin for a whole day. Haematoxylin and eosin dye is used to stain the paraffin-made specimens after they have been sectioned to a size of 3-5 μm . An optical microscope was used to examine the histological sections.

2.2.10 Statistical Analysis:

The mean $\pm$ SD was used to tabulate the results. A statistical analysis system was used to do an analysis of variance (ANOVA) on the experimental data for a completely randomized design [36]. To ascertain mean differences at the 5% level, Duncan's multiple range tests were employed.

2.2.11 Ethical approval

All the experimental and animal care protocols were ethically approved by the Institutional Animal Care and Use Committee (IACUC) at Menoufia University, Shebin El-Kom, Egypt (Approval No. MUFHE/S/NFS/15/24). All biological experiments were performed in compliance with the policies of the IACUC for the use and care of laboratory animals. Top of Form

3. RESULTS AND DISCUSSION

The study had shown the potency of dietary intervention with aloe vera and pomegranate extract as antiulcer formula of induced rats with gastric ulcer.

Data in Table (1) showed the effect of pomegranate and aloe vera fortified with yogurt on body weight gain, feed intake, and feed efficiency ratio of the experimented groups. There was a significant ($p < 0.05$) reduction in BWG in the positive control group (58.00 ± 3.92 g) compared with the negative control group (116.87 ± 4.61 g) and treated groups. This was in line with previous findings by Tahoon and El Sheikh [37] who reported that FI, BWG and

FER were decreased in ulcer peptic groups than normal control.

These results were consistent with those of Malik et al [38], who reported that weight loss may be a consequence of gastric ulcer pain, which intensifies two to three hours after a meal. Due to the enlargement of the ulcerated area, peptic ulcers can also produce a blockage in the digestive tract, resulting in weight loss, frequent vomiting, and an early sense of satiety. Peptic ulcers could increase the danger of internal bleeding, and until the stomach or small intestinal lining was pierced, open sores may continue to grow, putting the patient at risk for peritonitis [Ministry of Health, 2025]. This can lead to malnutrition, especially if there is stenosis, which might prevent normal food intake. Thus, anemia, melena, hematemesis, or weight loss were all signs of peptic ulcer problems in any patient. While the ulcerative groups that fortified with combined pomegranate and alovera fortified with yogurt had the best ameliorative effect, followed by AVG, then PMG by means values of 106.62 ± 3.73 , 98.75 ± 1.83 , and 80.87 ± 2.79 g/28day/r, respectively. These results were in harmony, with those obtained by Ismael et al [39] and Nna et al [40] who indicated that aloe vera suspension gel consumption was associated with higher body weight.

The significant improvement in body weight observed when taking aloe vera extract, that could be attributed to the good influence on the nature of the small intestinal flora. The ability of the aloe vera plant to improve digestion efficiency due to its enzymes content, such as carboxy-peptidase, catalase, cellulose, and peroxidase, may be responsible for the increase in live body weight. Additionally, this plant contains many vitamins, including vitamins (A, C, and E), group B vitamins, folic acid, and choline. B vitamins play a role in amino acid metabolism [41]. Similar results were obtained by Aziz and Al-badry [42] who reported that rats which received pomegranate peel extract at different concentrations gained significantly

more weight than those who had stomach ulcers.

Moreover, the reason for the significant weight gain could be attributed to the antioxidant properties of pomegranate peels, which enhance the animals' eating abilities. This is consistent with the findings of Li et al. [43], who demonstrated that the peels contain antioxidants in the form of multiphenol compounds and tannins.

Pomegranate peels are a good therapy option because they include antioxidants and vitamins. This is in line with the findings of Kulkarni et al. [44], who discovered that pomegranate peels had high quantities of vitamin B5 and vitamin C. Another factor contributing to this increase is the part that plant components play in lowering lipid peroxidation brought on by stomach ulcers. Heeb et al. [45] discovered that indomethacin causes lipid peroxidation and the production of free radicals. This is comparable to the findings of Larrosa et al. [46], who reported that the tannins in pomegranate peels had the ability to scavenge free radicals and stop lipid peroxidation.

Consistent with the conclusions stated by Haque et al. [47], who observed that using yogurt as a dietary supplement can increase body weight gain without changing blood triglyceride and cholesterol levels. This outcome supported the conclusions of Sultana et al. [48], who showed that using 5g yogurt as a nutritional supplement boosted weight gain as opposed to the control group. The activity of probiotic bacteria is one of the reasons why living organisms gain weight. According to earlier studies, the utilization of nutrients and their absorption by absorptive cells are what lead to the increase in digestive efficiency [49]. According to earlier research, the presence of probiotic bacteria increased the morphometric surface of intestinal villi and the activity of digesting enzymes. Increased digestibility, nutrient absorption, and the development and enlargement of new tissues are all impacted by this physiological state

[50]. Other researchers have also published the findings of the same study [51].

Adriani et al. [50] have also documented an increase in the number and width of the jejunal villi from diet plus probiotics that affects the broilers' ultimate body weight.

Furthermore, several researchers have highlighted that boosting the population of microorganisms that are advantageous to cattle would stop the growth of pathogenic microbes in the food's digestive tract [52].

Regarding FI, the most observative findings were that APG increased the amount of food intake that reached the same intake of the negative control group without significant difference, and PMG did not change more than APG while differing significantly ($p < 0.05$) from NCG, being 16.86 ± 0.77 , 17.67 ± 0.65 , and 15.94 ± 1.00 g/day, respectively. While AVG ate more, it consumed the least amount of food (14.93 ± 0.99 g/day) compared to the other fortified groups, with no discernible difference. Our findings are in line with those of Setyaningrum et al. [53] and Khan et al. [54], Who discovered that consuming yogurt as a dietary aid elevated feed intake (FI), FER, and live weight gain of broiler chickens.

For FER, the treated group with combined pomegranate and aloe vera fortified with yogurt had a better feed efficiency influence without a significant difference from NCG; the values were 0.22 ± 0.013 and 0.23 ± 0.012 , respectively. On the other hand, the other experimented groups supported by each type separately improved but differed significantly ($p < 0.05$) when compared with PCG by means values of 0.20 ± 0.018 , 0.18 ± 0.009 , and 0.13 ± 0.017 for AVG, PMG and PCG, respectively.

By enhancing digestion and encouraging feelings of fullness, aloe vera juice may help with weight management. It can help control hunger, lessen cravings, and promote a healthy metabolism when consumed on an empty stomach. Polysaccharides found in aloe vera aid in the intestines' absorption of

nutrients. The bioavailability of vitamins, minerals, and other nutrients consumed throughout the day may be improved by consuming aloe juice on an empty stomach [54].

According to the study's findings, taking supplements of pomegranate peel considerably lowers body mass index, weight, waist circumference, and fat mass index. In line with our findings, a 2019 study on rats fed a high-fat diet discovered that the group that received cake with 15% pomegranate peel powder gained less weight than other groups [56]. Nonetheless, data indicates that pomegranate peel's appetite-suppressing benefits are more pronounced when a high-fat diet is followed. Pomegranate peel has been shown in animal tests to have a favorable effect on hunger by influencing leptin. Pomegranate peel powder administration significantly reduced leptin levels in another study conducted by Soliman et al. [57] on overweight mice. Pomegranate peel's ability to suppress appetite may account for the treatment group's (PMG) absence of noticeable weight reduction during the research and their lower level of diet acceptance compared to the Aloe vera intervention group.

The data presented in Table 2 illustrate the effect of yogurt-fortified pomegranate and aloe vera on complete blood cells (CBC). Prior to the onset of the experiment, all infected groups had significantly ($p \leq 0.05$) lower RBC than NCC. Compared to the treated groups and the positive control group (3.46 ± 0.44 $10^6/\text{cm}^3$), the RBCS count of the rats in the APG (7.03 ± 0.59) was significantly higher ($p \leq 0.05$) following the dietary intervention. However, compared to all experimental groups, the negative control group had a significantly higher value (8.56 ± 0.59 $10^6/\text{cm}^3$). There was no significant difference ($p < 0.05$) in the count of RBCS between AVG and PMG.

Table (1). Effect of dietary intervention with pomegranate and alovera fortified in yogurt on BWG, FI and FER of induced rats with peptic ulcer

Groups	BWG (g/28day/r)	FI (g/day)	FER (%)
	Mean±SD	Mean±SD	Mean±SD
NCG	116.87a±4.61	17.67a±0.65	0.23a±0.012
PCG	58.00 e±3.92	12.28c±1.02	0.13d±0.017
AVG	98.75c±1.83	14.93b±0.99	0.20c±0.018
PMG	80.87 d±2.79	15.94b±1.00	0.18b±0.009
APG	106.62b±3.73	16.86ab±0.77	0.22a±0.013
LSD	7.841	1.652	0.013

Values are expressed as mean±SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant ; BWG: Body weight gain; FI: Food Intake; FER: Feed Efficiency Ratio; NCG: negative control (-ve) group; PCG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

As for blood hemoglobin (HB) values, before dietary intervention, the induced rats with peptic ulcers showed a significant decrease compared to the negative control group (15.40 ± 0.46 g/dl). while it had significantly increased among treated groups when compared to the positive control group (7.37 ± 0.65) after dietary intervention, with the highest significant ($p < 0.05$) values in APG (12.25 ± 0.70 g/dl).

Moreover, the highest hematocrit (HCT) value (41.37 ± 2.39) was found in rats of the APG which nearly to the negative control group 43.24 ± 1.89 but differed significantly ($p < 0.05$), and the lowest HCT (29.94 ± 1.33) was found in rats of the positive control group. There were no significant differences between

AVG and PMG in their effect on HCT, which were 38.80 ± 1.58 and $38.02 \pm 0.77\%$, respectively.

In line with the findings of Gopinathan [58], and Rajendran et al. [59], who noted that supplementing with aloe vera gel improved counts of red blood cells and enhanced blood hemoglobin and oxygen carrying capacity. Niewiadomska et al. [60] and Mahmoud et al. [61] showed similar results, stating that PPE co-administration enhanced RBC count, hemoglobin content, and hematocrit percentage. This demonstrates that PPE can help for enhancing RBC production, maturation, and survival. PPE compounds may stimulate erythropoiesis and protect RBCs from oxidative stress.

Table (2). Effect of dietary intervention with pomegranate and alovera fortified in yogurt on RBCs, Hgb and Hct of induced rats with peptic ulcer.

Groups	RBCs (106/cm m)			Hgb(g/dl)			Hct(%)		
	PRE	Post	Sig	Pre	Post	Sig	Pre	Post	Sig
NGG	9.62a±0.81	8.56a±0.59	0.015	15.40a±0.46	15.51a±0.43	0.594 ^{NS}	41.9a±1.04	43.2a±1.89	0.108 ^{NS}
PGG	3.50b±0.45	3.46d±0.44	0.883 ^{NS}	7.37b±0.65	7.41d±0.43	0.914 ^{NS}	29.4bc±1.69	29.9d±1.33	0.525 ^{NS}
AVG	3.58b±0.43	6.00c±0.58	0.000	7.27b±0.60	10.9c±0.48	0.000	29.6bc±0.93	38.8c±1.58	0.000
PMG	3.87b±0.37	5.62c±0.66	0.000	7.53b±0.68	10.0c±0.31	0.000	30.1b±0.67	38.0c±0.77	0.000
APG	3.69b±0.35	7.03b±0.59	0.000	7.02b±0.48	12.25b±0.70	0.000	28.3c±1.48	41.3b±2.39	0.000
LSD	0.381	0.402	--	0.522	2.553	--	1.466	1.850	--

Values are expressed as mean±SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant; RBCs: Red Blood Cell Count; Hgb: Hemoglobin; Hct: Hematocrit; NGG: negative control (-ve) group; PCG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

The results are consistent with those of Al-Hadidi [62] who showed that probiotics can increase the number of red blood cells and aid in their return to normal levels via a variety of methods. The drop in pH ascribed to the

fermentation processes induced by probiotics is a crucial factor among them. Additionally, as noted by Abudabos et al. [63], the synthesis of vitamin B-complex by probiotics has been found to be a major factor in the

enhancement of red blood cell quality, control of hemoglobin concentration, and regulation of blood cell size. This support from earlier studies highlights the positive effects of probiotics on hematological markers. Also, this outcome is consistent with the findings of Marcia et al. [64], who revealed that yogurt therapy improved hematological markers such as HG and RBC over 4 weeks. Hoppe et al. [65] reported that in people with an increased need for iron supplementation of *L. plantarum* 299v together with a meal enhances the bioavailability of iron.

The data recorded in Table (3) reflected the effect of oral administration of yogurt-fortified pomegranate and alovera on MCV, MCH, and MCHC. At the beginning of the experiment, there were non-significant differences observed in the level of MCV among all ulcerative groups and each other, but there was a significant increase in ulcerative gastric rats compared with the positive control group (51.32 ± 0.84 fl). At the end of the experimental periods, APG had the greatest ameliorative benefit when compared to the negative control group after AVG, followed by PMG by means values of 69.21 ± 1.10 , 79.90 ± 2.83 , 65.47 ± 2.09 , and 63.30 ± 1.94 fl, respectively.

As well, the mean corpuscular hemoglobin (MCH) count was 28.36 ± 1.77 pg in healthy control animals, and it drastically decreased to 16.84 ± 0.88 pg in the positive control animal. But the other groups of animals that were treated significantly enhanced the MCH count to 24.44 ± 2.05 , 23.48 ± 1.56 and 21.84 ± 0.88 pg for APG, AVG and PMG, respectively, showing no significant distinction between APG and AVG. These findings concurred with those of earlier research. Salama et al. [66] demonstrated that oral supplementation of 0.50g/kg aloe vera gel significantly increase mean corpuscular hemoglobin (MCH), mean corpuscular volume (MCV) and MCHC.

In the same table, the mean corpuscular hemoglobin concentration (MCHC) count was lower in the ulcerative groups than in the in the negative control group (33.62 ± 1.83 g/dl)

before dietary intervention. While the ulcerative group that fortified with combined pomegranate and alovera with yogurt showed a higher count of MCHC (30.02 ± 0.86 g/dl) than the positive control group (21.38 ± 0.86 g/dl) and the other fortified group, there was no significant difference ($p \leq 0.05$) between AVG and PMG.

There are strong research data from Zakrzewska et al. [67] who mentioned that some probiotics, such as *Lactobacillus acidophilus* and *Bifidobacterium longum* improve iron absorption and influence the course of anemia, this may be due to the ability of prebiotics to lower the pH of the colon, increasing the reduction of Fe^{3+} to Fe^{2+} , as well as the fermentation process that enhances SCFA production, which may contribute to increased colon absorption area [68]. The explanation for these findings could be that probiotics help lessen oxidative stress, which supports the health and function of red blood cells. To reduce oxidative damage, they do this by producing antioxidants such as glutathione, folate, and short-chain fatty acids and by strengthening endogenous antioxidant enzymes that neutralize reactive oxygen species. RBC, HCT, MCH, and MCHC levels are stabilized by probiotics through the reduction of oxidative stress [69]. These results also align with those of Koker et al. [70], who found that probiotic supplementation during the first 30 days of iron replacement therapy (IRT) improved blood iron indicators and Hb levels in individuals with iron deficiency anemia (IDA). Furthermore, probiotics may improve the absorption of vital nutrients like vitamin B12 and folate, which are necessary for the synthesis of red blood cells and the maintenance of MCH and MCHC levels, by promoting gut health. This enhanced nutritional absorption may support hematological health and mood stabilization by promoting optimal RBC, HCT, MCH, and MCHC levels [71].

Table (3). Effect of dietary intervention with pomegranate and alovera fortified in yogurt on MCV, MCH and MCHC of induced rats with peptic ulcer.

Groups	MCV(fl)			MCH(pg)			MCHC(g/dl)		
	Pre	Post	Sig	Pre	Post	Sig	Pre	Post	Sig
NGG	81.57a±1.68	79.90a±2.83	0.043	29.25a±1.67	28.36a±1.77	0.261 ^{NS}	33.62a±1.83	35.29a±.83	0.073 ^{NS}
PGG	51.00b±1.01	51.32e±0.84	0.565 ^{NS}	16.88b±0.84	16.84d±.88	0.917 ^{NS}	21.69b±0.54	21.38d±.86	0.142 ^{NS}
AVG	51.67b±0.99	65.47c±2.09	0.000	16.77b±0.77	23.48b±1.56	0.000	21.54b±0.81	28.7c±1.24	0.000
PMG	51.50b±1.19	63.30d±1.94	0.000	17.43b±0.87	21.84c±0.88	0.000	21.29b±0.80	28.1c±0.91	0.000
APG	51.43b±1.16	69.21b±1.10	0.000	16.86b±0.86	24.44b±2.05	0.000	21.18b±0.72	30.0b±0.86	0.000
LSD	2.170	2.069		0.109	1.107		2.750	1.041	

Values are expressed as mean±SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant ; MCV:Mean Corpuscular Volume;MCH:Mean corpuscular; MCHC:Mean Corpuscular Hemoglobin concentration; NGG: negative control (-ve) group; PGG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

The results in Table 4 indicated the effect of yogurt fortified with pomegranate and alovera on the platelet count, white blood cells, and percentage of eosinophils. Prior to the oneest, there was a significant ($p < 0.05$) reduction in the platelet count in the ulcerative groups compared with the negative control group ($837.85 \pm 5.32 \times 10^3/\text{ul}$). While it had significantly increased ($p \leq 0.05$) among all treated rat groups when compared to the negative control group following nutritional therapy, with the highest significant ($p < 0.05$) values in the mixed group ($790.00 \pm 5.75 \times 10^3/\text{ul}$).

Within the same table, the white blood cell count was higher in the disease-control rat than healthy control animals ($6.17 \pm 0.82 \times 10^3/\text{ul}$). But the pre-treated groups with nutritional therapy brought down the WBC in their groups. The amount of WBC in the combined group ($8.55 \pm 0.87 \times 10^3/\text{ul}$) was almost comparable to the healthy control group. There was no significant difference ($p \leq 0.05$) in AVG and PMG with values of 9.50 ± 0.81 and $9.78 \pm 0.58 \times 10^3/\text{ul}$, respectively. Additionally concurring with these conclusions, El Bohi et al. [88] reported that PPE can impact leukocyte survival, differentiation, or generation, assisting in the maintenance of a well-balanced immune response overall. Moreover, the results obtained today also aligned with those

released by Darabighane et al. [89] who claimed that adding aloe vera gel to broiler diet increased the number of white blood cells in the birds overall. Also, this outcome is consistent with the findings of Marcia et al. [64], who revealed that yogurt therapy improved hematological markers such as WBC over 4 weeks.

Concerning the EOS, at the start of the trial, there were no significant variations ($p \leq 0.05$) in the percentage of eosinophils across all ulcerative groups and each other. Although there was a substantial increase ($p \leq 0.05$) in ulcerative gastric rats compared to the negative control group ($2.45 \pm 0.53\%$). After the trial has ended, The value of the combined group ($3.23 \pm 0.58\%$) was the lost ,almost equal to that of the negative control group when compared to the positive control group ($5.80 \pm 0.35\%$) and the other fortified group. There was no significant difference ($p \leq 0.05$) between APG and AVG or between AVG and PMG. Although there was a significant difference ($p < 0.05$) between APG and PMG. These outcomes also concurred with Hasan et al.'s [90] and Niewiadomska et al. [60] recorded data, which revealed that the group that received treatment with pomegranate peel aqueous extract exhibited a noteworthy rise in eosinophil count when compared to other groups.

Table (4). Effect of dietary intervention with pomegranate and alovera fortified in yogurt on PLT, WBCs and EOS of induced peptic ulcer rats.

Groups	PLT(*10 ³ /ul)			WBCs(*10 ³ /ul)			EOS(%)		
	PRE	Post	Sig	Pre	Post	Sig	Pre	Post	Sig
NGG	837.8a±5.32	828.7a±6.62	0.001	6.17c±0.82	5.74c±0.80	0.291 ^{NS}	2.45a±0.53	2.82d±0.54	0.353 ^{NS}
PGG	677.4c±5.23	688.8e±4.85	0.011	15.39a±0.55	15.70a±0.63	0.303 ^{NS}	5.78b±0.46	5.80a±0.35	0.950 ^{NS}
AVG	687.4b±4.65	774.4c±4.03	0.000	14.7ab±0.79	9.50b±0.81	0.000	6.16b±0.49	3.5bc±0.35	0.000
PMG	667.7d±5.09	766.5d±4.13	0.000	14.45b±0.63	9.78b±0.58	0.000	5.91b±0.51	3.89b±0.31	0.000
APG	659.2e±5.09	790.0b±5.75	0.000	15.0ab±0.97	8.55c±0.87	0.000	6.07b±0.42	3.2cd±0.58	0.000
LSD	2.573	7.521		0.910	0.932		0.438	0.566	

Values are expressed as mean±SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant ; PLT: Platelet Count; WBC: White Blood Cells; EOS: Eosinophils; ; NGG: negative control (-ve) group; PGG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

Table (5) exhibits the effect of Dietary Intervention with Pomegranate and Aleo vera on antioxidant enzymes and oxidative stress indicators of rats with peptic ulcer. the antioxidant as measured by Superoxid dismutase (SOD) and Catalase (CAT) and the oxidative stress were measured by Malondialdehyde (MDA).in compaision to the negative control group(31.09±0.77u/ml), the rats which received ethyle alchol shown aconsiderable decrease in SOD level before the food intervention. Also, in agreement with these findings, Alotaibi et al. [72] reported that when rats were given ethanol, there was a decrease in SOD level.

More significantly rise ($p \leq 0.05$) in SOD level among treated groups when compared to the positive control group(10.46±0.35u/ml) following a nutritional intervention. the best results are existed in the combined group (APG), where it recorded values(25.03±0.55u/ml). The current findings were also consistent with those published by Abozakra et al. [73] and Abdel Moneim [74], who discovered that treatment with PPE in diets had a large increase in SOD activity and a considerable decrease in MDA in a dose-dependent manner. These results could be explained by the polyphenolic chemicals (catechin, naproxene, ellagic acid, gallic acid, cholinergic acid, and vanillin) present in PPE. Because of their antioxidant qualities, these substances lessen oxidative stress by reducing lipid peroxidation, hydrogen peroxide, and superoxide anion levels. They also have potent anti-free radical properties.[75] and [76]. Also,

Ali et al. [77], who reported that probiotics can increase SOD levels because probiotics can reduce oxidative stress and inflammation.

Additionally, there was a high statistical difference($p < 0.5$) between all treatment groupings and the positive control group(0.69±0.15ng-ml) in CAT activity. The highest CAT activity (10.56±1.35). was seen in the negative control group followed by combined group (6.65±1.04ng-ml). no statistical significance was found between AVG and PMG with values of 4.72±0.92 and 3.56±0.80ng-ml, respectively. These results were in line with those of previous studies Hussein et al[78] who reported that aloe vera decreased oxidative stress as seen by higher gastric CAT levels and decreased stomach MDA). Aloe vera has a strong antioxidant impact because of its ability to scavenge free radicals and chelate metals [79]. It is also brought on by a high concentration of enzymes (catalase, superoxide dismutase, and glutathione peroxidase), phenolic antioxidants (chromones, coumarins, saponins, flavonoids, and tannins), and antioxidant-containing vitamins (A, E, and C). The OH group preserves the thiol content of tissues and inhibits the oxidation of cellular proteins by preventing the -SH group from being broken down oxidatively [80]. These results corroborate Singh et al. [81] observations, which stated that Pomegranate peel extract boosted catalase (CAT), and superoxide dismutase (SOD) in mice while decreasing MDA levels. As a result, using pomegranate peel in decoctions (concentrated aqueous heated extract) may

increase the concentration of phenolic components, dietary fiber, polysaccharides, vitamins, and minerals [82].

When examined in terms of oxidative stress parameters, MDA levels had significantly increased ($p \leq 0.05$) in the Rats with stomach ulcers when compared to the normal group (1.17 ± 0.23 nmol-ml) before the study began. This was consistent with Chams and Eissa[83], Abdel-Kawi et al.[84] and Paulrayer et al. [85], finding that ethanol administration in rats resulted in an increase in MDA concentration. There is evidence linking oxidative stress to the pathogenesis of GU. It arises from an imbalance between ROS and antioxidants, which causes GU. By causing lipid peroxidation and the stomach mucosa's antioxidant

reserves to be depleted, alcohol causes oxidative stress. Lipid peroxidation culminates in MDA, which is widely employed as a reliable marker of lipid peroxidation [86].

While there were significantly decrease among treated groups when compared to the positive control group (9.36 ± 1.22 nmol-ml) after dietary intervention. The Malondialdehyde activity of the APG was the lower than those of both AVG and PMG by means values of 1.54 ± 0.53 , 2.77 ± 0.50 and 3.79 ± 1.11 nmol-ml), respectively. These results are consistent with those obtained by Ejtahed et al. [87], who found that there was a significant drop in MDA levels in the probiotic treated group following intake of probiotic yogurt.

Table (5). Effect of dietary intervention with pomegranate and alovera fortified in yogurt on antioxidant indicators of induced rats with peptic ulcer

Groups	SOD (u/ml)			CAT(ng-ml)			MDA(nmol-ml)		
	PRE	Post	Sig	Pre	Post	Sig	Pre	Post	Sig
NGG	31.09 ± 0.77	30.47 ± 1.81	0.360 ^{NS}	11.73 ± 0.87	10.56 ± 1.35	0.148 ^{NS}	1.17 ± 0.23	0.71 ± 0.99	0.001
PGG	10.04 ± 0.90	10.46 ± 0.35	0.230 ^{NS}	0.58 ± 0.16	0.69 ± 0.15	0.125 ^{NS}	11.0 ± 1.55	9.36 ± 1.22	0.022
AVG	9.89 ± 0.72	22.56 ± 0.54	0.000	0.44 ± 0.13	4.72 ± 0.92	0.000	10.68 ± 0.98	2.77 ± 0.50	0.000
PMG	10.70 ± 0.85	20.06 ± 0.61	0.000	0.67 ± 0.12	3.56 ± 0.80	0.000	9.67 ± 1.44	3.79 ± 1.11	0.000
APG	9.80 ± 0.87	25.03 ± 0.55	0.000	0.33 ± 0.15	6.65 ± 1.04	0.000	14.54 ± 1.72	1.54 ± 0.53	0.000
LSD	1.034	1.471	--	0.432	1.287	--	1.102	0.772	--

Values are expressed as mean $\pm$ SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant; SOD: Superoxide dismutase; MDA : Malondialdehyde ; CAT: Catalase ; NGG: negative control (-ve) group; PGG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

The statistical data presented in Table 6 shows that the effect of pomegranate and aloe vera fortified with yogurt on the volume and PH values of gastric juice in normal rats and rats with stomach ulcers. A significant reduction ($p \leq 0.05$) in the volume of gastric juice (2.40 ± 0.47 ml/100g) was observed in the combined group, almost to the negative control group (2.53 ml/100 g) when compared to the positive control group (4.82 ± 0.22 ml/100 g). Followed by AVG and PMG by means values of 3.50 ± 0.44 and 4.02 ± 0.34 ml/100 g, respectively. The result of the study came in accordance with Piracha et al.[91] and Alimi et al.[92]who reported that the treatment groups that received the extract of Punica granatum (pomegranate) peel demonstrated a significant decrease in gastric

juice volume, and increase in gastric juice ph. Furthermore, it has been discovered that pomegranate peel extracts raise PGE2 and NO levels, reduce oxidative stress, and prevent the release of pro-inflammatory cytokines. The stomach H⁺, K⁺-ATPase enzyme, which is crucial for controlling gastric ulcers and lowering the generation of gastric acid, was likewise effectively inhibited by the extracts. Regarding PH, when comparing the PH value of gastric juice to that of normal rats, the ulcerated rats without treatment experienced the highest decrease, which was recorded at 1.37 ± 0.12 mEQ/L. These results are in harmony with those obtained by Sanpinit et al. [93] and Rahman et al. [94] who indicated that when ethanol is injected, the pH of the gastric juice decreases, gastric mucus

synthesis decreases, and inflammatory cells infiltrate the gastrointestinal mucosa because of injury. Conversely, all treated groups of gastric ulcer rats significantly increased ($p \leq 0.05$) the PH value compared to the positive control group, and the combined group showed the highest significant increase (3.90 ± 0.33 m EQ/L) with no significant difference ($p \leq 0.05$) from the negative control group, which recorded (4.03 ± 0.35 m EQ/L). These outcomes supported the findings of previous studies Retiu et al. [95] who reported that aloe vera treatment markedly increased stomach pH because it prevented the release of acid). Aloe vera increases gastrointestinal pH, promoting normal enzyme activity and iron and calcium absorption. The plant's lectin content could be the reason behind aloe vera's inhibitory action [86]. Lectins prevent parietal cells from absorbing aminopyrine. As a result, reducing stomach acid is the direct outcome of influencing acid-secreting cells [96]. Retiu et al. [95] showed that gel aloe vera can be used to maintain a normal gastric pH of 1-2 to 4-5 and expedite the reduction of stomach acid secretion (HCl generation). Reduced HCl in the stomach result in a reduction in gastritis discomfort. The primary cause of aloe's laxative effect is the presence of aloin A and B, 1, 8-dihydroxyanthracene glycosides. The alkaline content of aloe vera aids in balancing and reducing excess stomach acid.

The data presented in table 7 elucidated the effect of oral administration of yogurt-fortified pomegranate and alovera on the number of ulcers, ulcer score, and ulcer index of stomach ulcer rats. There is a reduction in the average ulcer number in all treaded rat groups compared to the positive control group, which has an average ulcer number of 6.37 ± 0.51 , and the lowest average (1.12 ± 0.99) was found in the combined group. There was no significant difference ($p \leq 0.05$) in the average number of ulcers counts between AVG and PMG by means values of 2.87 ± 0.83 and 3.00 ± 1.30 , respectively. Therefore, the ulcer score, The ulcerated control group had the

highest value in the ulcer score (10.03 ± 1.05) compared with all treated groups, whereas the ulcer score of the APG was lower than those of both AVG and PMG with values of 3.34 ± 0.45 , 5.20 ± 0.54 , and 6.93 ± 0.54 , respectively.

Table (6). Effect of dietary intervention with pomegranate and alovera fortified with yogurt on Volume and PH of gastric juice of induced peptic ulcer rats.

Groups	Gastric Vol(ml/100g)		PH(m EQ/L)	
	M $\pm$ SD	Sig	M $\pm$ SD	Sig
NGG	2.53d $\pm$ 0.43	0.000	4.03a $\pm$ 0.35	0.000
PGG	4.82a $\pm$ 0.22		1.37d $\pm$ 0.12	
AVG	3.50c $\pm$ 0.44		2.95b $\pm$ 0.34	
PMG	4.02b $\pm$ 0.34		1.94c $\pm$ 0.23	
APG	2.40d $\pm$ 0.47		3.90a $\pm$ 0.33	
LSD	0.410		0.527	

Values are expressed as mean $\pm$ SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant;GV:Volum of gastric acid;PH:Potential of Hydrogen; ; NGG: negative control (-ve) group; PGG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

When estimating the ulcer index, the disease control group's mean index was severe (1620.81 ± 433.29), but it decreased in the other animal groups. This agreed with the reports of Karampour et al. [97] and Bakry et al. [98] that the ulcer index of experimental animals increase after ethanol administration. The APG (359.71 ± 44.14) showed the maximum inhibition of the ulcer index, with no discernible change from the AVG. While APG differed considerably ($p < 0.05$) from PMG by mean values of 724.18 ± 15.17 , 542.15 ± 21.68 , and 359.71 ± 44.14 for PMG, AVG, and APG, respectively, PMG did not vary more than AVG.

The result of the study came in accordance with Piracha et al. [91] and Chauhan et al. [99] and Ajaikumar, et al.[100] who reported that the treatment groups that received the extract of Punica granatum (pomegranate) peel demonstrated a significant decrease in ulcer index. These findings concurred with earlier research Silla et al. [101], which revealed that PPE dramatically slowed the growth of

bacteria and successfully decreased oxidative stress and inflammation in human gingival epithelial cells (HGECS). Pomegranate's anti-inflammatory and antioxidant qualities were credited in these studies with its protective qualities. The strong anti-inflammatory and antioxidant properties of PPE are attributed to its natural polyphenols, which include flavonoids and tannins. In fact, these benefits were supported by the rise in TT that coincides with the drop in TNF- α levels in the pomegranate peel-treated groups. PPE's protective qualities are probably due to the bioactive substances found in it, such as (E)-9-octadecenoic acid methyl ester, methyl 9-cis, 11-transoctadecadienoate, and other fatty acids. Strong antioxidant and anti-inflammatory properties of these substances may mitigate oxidative stress and inflammatory reactions [61].

These outcomes aligned with the findings of Mohamed et al. [102], who reported that treatment with aloe vera gel significantly decreased UI. The active components of aloe vera gel, such as tannins, saponins, and flavonoids, may be responsible for its cytoprotective properties [103]. Although aloe vera gel has been shown in numerous studies to be an effective medium for wound healing it is still unknown what precise mechanism causes and speeds up wound healing [104]. Aloeemodin, β -sitosterol, and β -sitosterol glucoside are its three angiogenic constituents [105]. Plasminogen activator can be strongly induced by β -sitosterol, which has a direct impact by raising the expression of the VEGF gene, which results in a rise in growth in the number of new blood vessels and the proliferation of endothelial cells [106].

Aloe vera's tannins, saponins, and flavonoids, which are its active ingredients, may be the reason for its capacity to heal wounds. Tannins and other polyphenolic compounds have been used as GU treatments because of their astringent qualities. To form a barrier over the injured tissues, they interact with tissue proteins in the GU and precipitate

microproteins at the ulcer site. In addition to shielding the underlying mucosa from harsh stimuli and preventing stomach secretion, the barrier also speeds up the healing process [107]. Auxin and gibberellin, which function as growth hormones and promote cell growth and regeneration to aid in wound healing, are also present in its gel [108].

Pomegranate peel powder (10%) has been introduced as an efficient and cost-effective antiulcer compound by Mohamed and Mabrok [109], who found that it has an antiulcer effect in tested rats by reducing the expression of inflammation markers and regulating NO, which increases mucus secretion.

Probiotics may strengthen the stomach's mucosal barrier, which guards against stomach acid damaging the stomach lining. Enhancing this barrier can help existing ulcers heal more quickly and have a preventative effect on the emergence of new ulcers.

Probiotics may aid in lowering the production of excess stomach acid, which is a contributing factor to the development of ulcers, according to certain research. Probiotics can help create a more stable environment for the stomach lining by balancing the amounts of stomach acid.

With its high probiotic content, yogurt may help prevent and treat stomach ulcers. Consuming yogurt on a regular basis may help maintain a balanced gut microbiota and provide other healthy nutrients like calcium, proteins, and vitamins that support digestive health in general [110].

According to studies, certain probiotic strains, such *Lactobacillus acidophilus*, which is present in yogurt, may protect against gastric ulcers by lowering stomach inflammation and inhibiting the growth of dangerous bacteria like *H. pylori* [111].

Yogurt's probiotics may also help maintain a healthy gut environment, which could aid in the repair of pre-existing ulcers and stop new ones from developing [112].

Table (7). Effect of dietary intervention with pomegranate and alovera fortified with yogurt on Number of Ulcer ,Ulcer Score and Ulcer Index of induced peptic ulcer rats

Groups	No Ulcer		Ulcer Score (US)		Ulcer index (UI)	
	Mean±SD	Sig	Mean±SD	Sig	Mean±SD	Sig
NGG	--		--		--	
PCG	6.37a±0.51		10.03a±1.05		1620.81a±433.29	
AVG	2.87b±0.83	0.000	5.20c±0.54	0.000	542.15bc±21.68	0.000
PMG	3.00b±1.30		6.93b±0.54		724.18b±15.17	
APG	1.12c±0.99		3.34d±0.45		359.71c±44.14	
LSD	1.63		1.137		182.030	

Values are expressed as mean±SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant; NO Ulcer: number of ulcer; Ulcer S :ulcer score ; UI :ulcer index; NGG: negative control (-ve) group; PGG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

The data listed in table 8 show the effect of dietary intervention with pomegranate and Aleo vera on the percentage of ulceration, the percentage of the preventive index, and the average severity of ulcers. In ulceration percent, the ulcerated control group had the highest value, which was $82.90 \pm 4.70\%$, followed by the pomegranate group, which was $60.26 \pm 3.68\%$, while the combined group had the least value, which was $35.87 \pm 5.89\%$, followed by the Aloevera group, which was $48.80 \pm 2.00\%$. These findings were consistent with Al-badry and Aziz [42], who reported that providing an aqueous extract of pomegranate peels at various concentrations significantly improved gastrointestinal ulceration in rat models. Also, Extracts from Punica granatum help repair and shield the stomach mucosa from injury [113]. Pomegranate reduced inflammation by inhibiting the production of pro-inflammatory cytokines such as TNF- α , IL-1 β , and IL-6, which are known to cause inflammation and damage to stomach tissue [114]. Pomegranate also increased the the synthesis of NO and PGE2, two substances that protect the stomach mucosa [115]. While NO controls blood flow and preserves the gastric mucosal defense systems, PGE2 preserves the integrity of the gastric mucosa and encourages tissue repair [116].

Over and above, there are good values of the protection ratio in all treated rat groups compared to the positive control group ($15.92 \pm 1.81\%$), where the combined group had the highest protection rate ($60.17 \pm 5.24\%$) compared to the other fortified group, which

recorded the following percentages (47.93 ± 3.57 and 37.16 ± 7.29) for AVG and PMG, respectively. This concurs with the findings of Mohamed et al. [102]. Aloe vera treatment significantly improved the protection ratio, which recorded 91% ulcer inhibition. The explanation for these findings could be Aloe vera contains enzymes such bradykinase and carboxypeptidase, which have analgesic and anti-inflammatory properties, according to Ahmed and Hussain [117].

Muhialdin et al.[118] found that the aqueous extract of Punica granatum (pomegranate) peel significantly inhibited the formation of stomach ulcers. The extract's high dose (500mg/kg) inhibited ulcer formation by 84.60%, whereas the low dose (250mg/kg) resulted in a 42.87% inhibition. Omeprazole, the typical medication, only had a 24.50% inhibitory effect.

Also, Alam et al [119] reported that the aqueous methanolic extract of Punica granatum had a significant 87.5% inhibition of ulcerative activity.

In the same table, in comparison to the positive control group, the combined group showed a considerable decrease in the average severity of ulcer scores of 5.57 ± 0.49 and 1.31 ± 0.62 , respectively. There were no significant changes among AVG and PMG in their influence on the average severity of ulcers while differing significantly ($p < 0.05$) from the NCG. Consistent with the conclusions made by Zedan et al. [120], who observed that Treatment with aloe vera Gel wound healing

accelerated the reepithelization process and prevented any inflammatory reactions in this investigation. This result may be explained by aloe-emodin, which by itself shows an anti-inflammatory response, and by β -sitosterol, which increases the proliferation of epithelial cells and aids in the reepithelialization of wound healing [121]. According to Chauhan et al.[99] treatment with peel extract from Punica granatum L. decreased the severity of stomach ulceration in rats that was brought on by ethanol (EtOH). PPE's anti-inflammatory properties may primarily stem from ellagitannins' capacity to reduce pro-inflammatory mediators like TNF- α and alter NF- κ B signaling, as has already been shown in a number of cell line types [122].

In keeping with the findings of Chauhan et al [123] who noted that Rats administered pomegranate peel extract (Punica granatum L.) demonstrated ulcer-healing and stomach-antiulcer properties .By reducing offensive factors like acid secretion and pepsin activity and increasing defensive factors like mucus secretion and mucosal glycoproteins, the extract demonstrated a strong protective effect against GUs. Additionally, the extract demonstrated antioxidant qualities by raising

GSH and CAT activity and decreasing oxidative stress in the stomach mucosa. According to these results, peel extract from Punica granatum L. may be helpful in the treatment and prevention of GUs.

Probiotics protect the gastric mucosal barrier; ii) Prostaglandins, mucus, growth factors, and anti-inflammatory cytokines are upregulated; iii) the ratio of cell proliferation to apoptosis is increased; and iv) angiogenesis is induced. These are some of the general health benefits associated with the cellular and molecular mechanisms of probiotics on various systemic and gastrointestinal disorders that accompany a gastric ulcer [111].

Probiotics have been shown in numerous studies to be effective in treating stomach ulcers. The study by Elliott et al. [124] gave rise to the concept of probiotic use. Gram-negative bacteria quickly colonized the ulcer site in a rat model of acetic acid-induced stomach ulcer, which seriously hampered ulcer healing. Gram-positive bacterial colonization, however, aided in the healing of ulcers. Notably, ulcer healing was hastened by administering the exogenous probiotic strain Lactobacillus.

Table (8). Effect of dietary intervention with pomegranate and alovera fortified with yogurt on %Ulceration, Preventive Index and Severity Ulcer of induced peptic ulcer rats.

Groups	Ulceration(%)		PI (%)		SOU	
	Mean $\pm$ SD	Sig	Mean $\pm$ SD	Sig	Mean $\pm$ SD	Sig
NGG	0.000e $\pm$ 0.00		--		--	
PGG	82.90a $\pm$ 4.70		15.92d $\pm$ 1.81		5.57a $\pm$ 0.49	
AVG	48.80c $\pm$ 2.00	0.000	47.93b $\pm$ 3.57	0.000	2.76b $\pm$ 1.30	0.000
PMG	60.26b $\pm$ 3.68		37.16c $\pm$ 7.29		3.43b $\pm$ 0.53	
APG	35.87d $\pm$ 5.89		60.17a $\pm$ 5.24		1.31c $\pm$ 0.62	
LSD	10.467		8.717		0.917	

Values are expressed as mean $\pm$ SD, means in the same columns with different letter are significantly ($P \leq 0.05$), LSD: Least significant of difference, *NS: Non significant; PI: Preventive Index; SOU: Severity of Ulcer ; NGG: negative control (-ve) group; PGG: positive control (+ve) group; AVG: alovera fortified with yogurt; PMG: Pomegranate fortified with yogurt ; APG: alovera and pomegranate fortified with yogurt.

There was sufficient evidence to suggest that probiotic consumption can help patients with stomach ulcers, lowering inflammation, and accelerating gut healing, even though the evidence supporting the direct role of yogurt and probiotics in ulcer treatment is still developing. Probiotics and yogurt should be

used as part of a comprehensive treatment strategy that may also include proton pump inhibitors or antibiotics.

Histopathological examination of stomach:

Microscopically, stomach of rats from group 1 revealed the normal histological architecture

of gastric layers (Figs. 1 & 2). In contrast, stomach of rats from group 2 showed remarkable histopathological alterations characterized by focal necrosis of gastric mucosa, mucosal inflammatory cells infiltration, submucosal edema associated with inflammatory cells infiltration (Figs. 3, 4, 5 & 6). Meanwhile, ameliorative effect was noticed in the stomach of rats from group 3; some examined sections from groups 3 exhibited slight submucosal edema (Figs. 7 & 8), whereas other sections from this group showed inflammatory cells infiltration in the mucosa (Fig. 9) and submucosa associated

with submucosal edema (Figs. 9 & 10). Furthermore, some stomach sections of rats from group 4 exhibited no histopathological lesions (Figs. 11 & 12), whereas other sections revealed inflammatory cells infiltration in the mucosa (Fig. 13), submucosal edema (Figs. 13 & 14) and submucosal few inflammatory cells infiltration (Fig. 14). Moreover, most examined gastric tissues of rats from group 5 described no histopathological lesions (Figs. 15, 16 & 17), whereas few sections showed focal necrosis of gastric mucosa (Figs. 18 & 19) associated with inflammatory cells infiltration (Fig. 19)

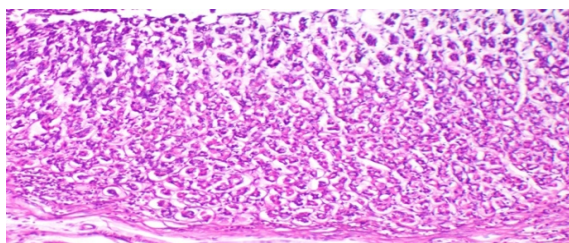


Fig. (1): Photomicrograph of stomach of rat from group 1 showing the normal histological architecture of gastric layers (H & E stain, X 100).

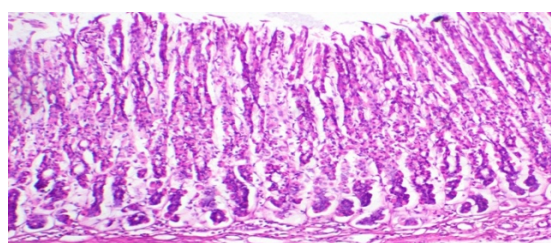


Fig. (2): Photomicrograph of stomach of rat from group 1 showing the normal histological architecture of gastric layers (H & E stain, X 100).

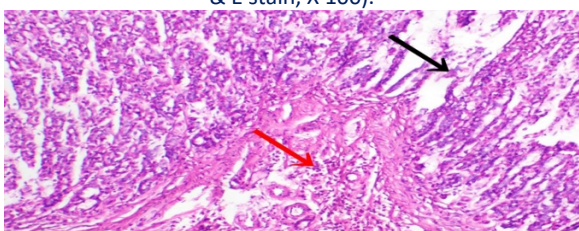


Fig. (3): Photomicrograph of stomach of rat from group 2 showing focal necrosis and sloughing of gastric mucosa (black arrow) associated with submucosal inflammatory cells infiltration (red arrow) (H & E stain, X 100).

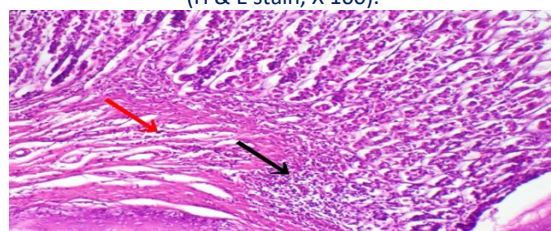


Fig. (4): Photomicrograph of stomach of rat from group 2 showing inflammatory cells infiltration in the mucosa (black arrow) and submucosa (red arrow) (H & E stain, X 100).

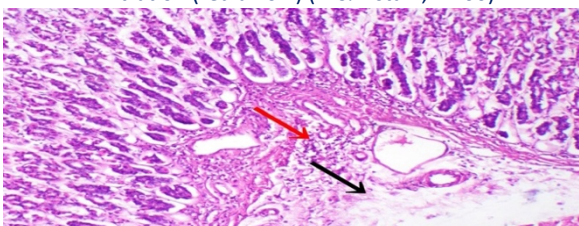


Fig. (5): Photomicrograph of stomach of rat from group 2 showing submucosal edema (black arrow) associated with inflammatory cells infiltration (red arrow) (H & E stain, X 100).

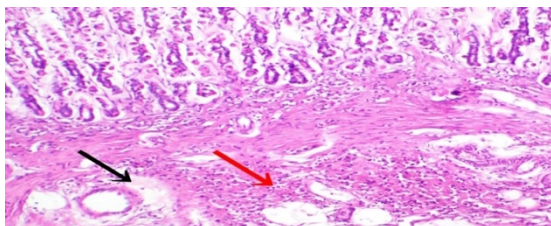


Fig. (6): Photomicrograph of stomach of rat from group 2 showing submucosal edema (black arrow) associated with inflammatory cells infiltration (red arrow) (H & E stain, X 100).

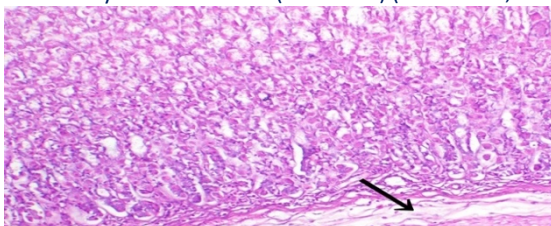
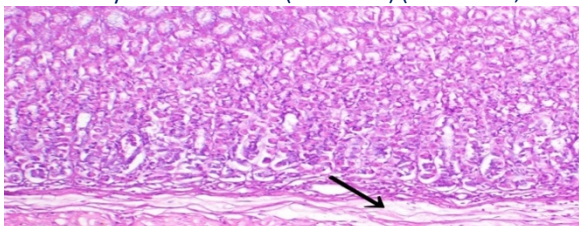


Fig. (7): Photomicrograph of stomach of rat from group 3 showing slight submucosal edema (arrow) (H & E stain, X 100).

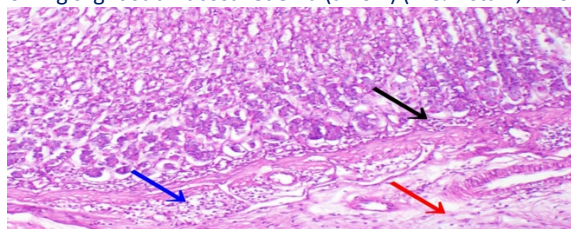


Fig. (8): Photomicrograph of stomach of rat from group 3 showing slight submucosal edema (arrow) (H & E stain, X 100).

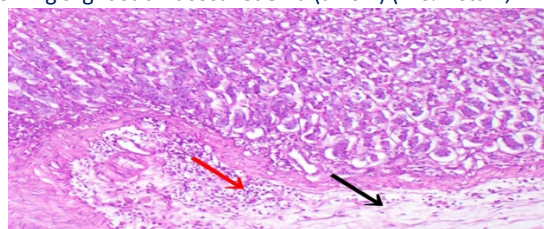


Fig. (9): Photomicrograph of stomach of rat from group 3 showing inflammatory cells infiltration in the mucosa (black arrow) and submucosa (red arrow) associated with submucosal edema (blue arrow) (H & E stain, X 100).

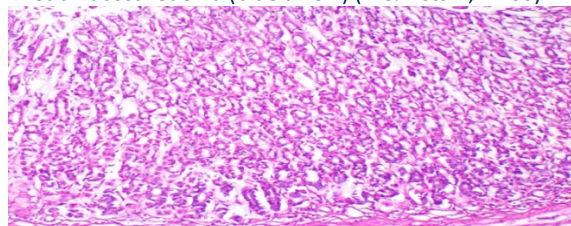


Fig. (10): Photomicrograph of stomach of rat from group 3 showing submucosal edema (black arrow) associated with inflammatory cells infiltration (red arrow) (H & E stain, X 100).

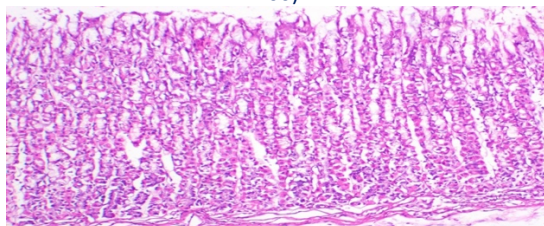


Fig. (11): Photomicrograph of stomach of rat from group 4 showing no histopathological lesions (H & E stain, X 100).

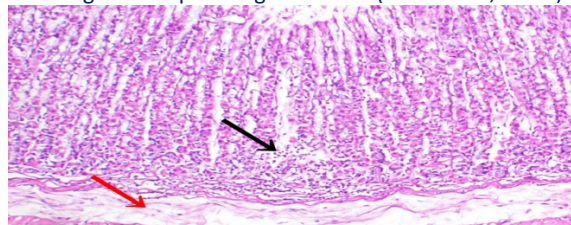


Fig. (12): Photomicrograph of stomach of rat from group 4 showing no histopathological lesions (H & E stain, X 100).

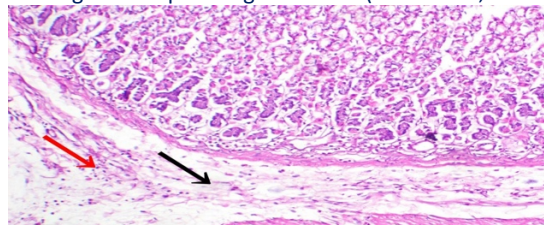


Fig. (13): Photomicrograph of stomach of rat from group 4 showing inflammatory cells infiltration in the mucosa (black arrow) associated with submucosal edema (red arrow) (H & E stain, X 100).

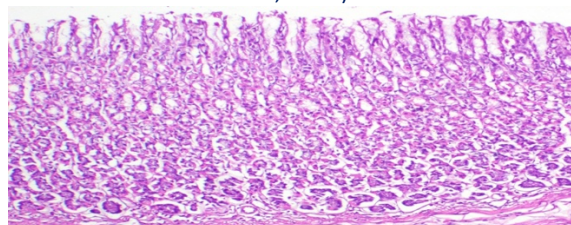


Fig. (14): Photomicrograph of stomach of rat from group 4 showing with submucosal edema (black arrow) associated with inflammatory cells infiltration (red arrow) (H & E stain, X 100).

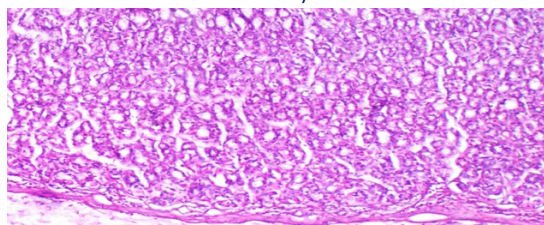


Fig. (15): Photomicrograph of stomach of rat from group 5 showing no histopathological lesions (H & E stain, X 100).

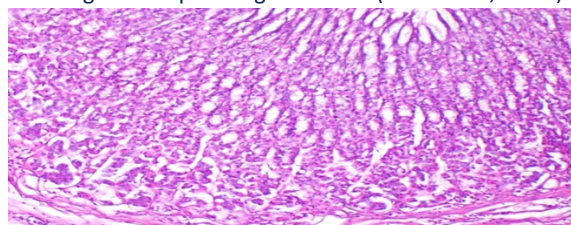


Fig. (16): Photomicrograph of stomach of rat from group 5 showing no histopathological lesions (H & E stain, X 100).

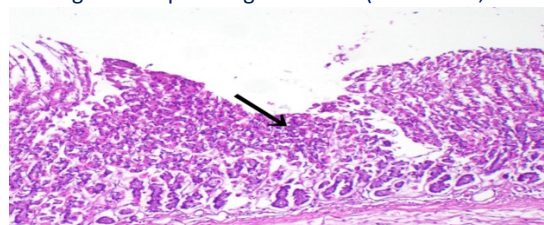
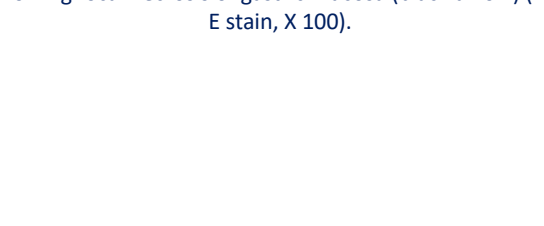


Fig. (17): Photomicrograph of stomach of rat from group 5 showing no histopathological lesions (H & E stain, X 100).



Fig. (18): Photomicrograph of stomach of rat from group 5 showing focal necrosis of gastric mucosa (black arrow) (H & E stain, X 100).



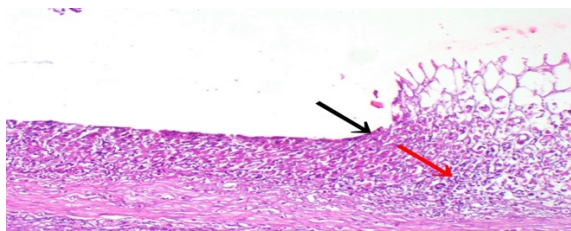


Fig. (19): Photomicrograph of stomach of rat from group 5 showing focal necrosis of gastric mucosa (black arrow) associated with inflammatory cells infiltration (red arrow) (H & E stain, X 100).

4. CONCLUSION

The study demonstrates that dietary intervention with aloe vera, pomegranate, and their combination significantly improved hematological parameters, oxidative stress markers, and ulcer healing in peptic ulcer-induced rats. The combined treatment group (APG) exhibited the most notable enhancements, including increased hemoglobin levels, RBC count, and antioxidant enzyme activity (SOD and CAT), alongside a significant reduction in malondialdehyde (MDA) levels. Additionally, combination formula achieved the highest ulcer protection rate and the most effective inhibition of the ulcer index, suggesting a synergistic effect of aloe vera and pomegranate in promoting gastric mucosal healing. These findings indicate that the combined dietary supplementation could be a promising natural therapeutic strategy for managing peptic ulcers.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

No fund has been received.

5. REFERENCES

1. Tarasconi A, Coccolini F, Biffl W, Tomasoni M, Ansaloni, L and Picetti E..Perforated and bleeding peptic ulcer: WSES guidelines.

- World J Emerg Surg.2020; 15(1):1–24.
[http://doi: 10.1186/s13017-019-0283-9](http://doi:10.1186/s13017-019-0283-9).
2. Rajagopal H, Manjegowda S, Serkad C and Dharmesh S.A modified pectic polysaccharide from turmeric (*Curcuma longa*) with antiulcer effects via anti-secretory, mucoprotective and IL-10 mediated anti-inflammatory mechanisms. International Journal of Biological Macromolecules.2018;118(A):864-880. ISSN 0141-8130. [http:// doi: 10.1016/j.ijbiomac.2018.06.053](http://doi:10.1016/j.ijbiomac.2018.06.053).
3. Borra S, Lagisetty R and Mallela G. Anti-ulcer effect of Aloe vera in non-steroidal antiinflammatory druginduced peptic ulcers in rats. African Journal of Pharmacy and Pharmacology.2011; 5 (16): 1867-1871.
[http:// DOI: 10.5897/AJPP11.306](http://DOI:10.5897/AJPP11.306).
4. Jimmy E, Umoh I and Usun V. Aloe Vera Heals Gastric Ulcer in 7 days than Omeprazole and Cimetidine: Prostaglandin. Anat Physiol.2020; 10 (321): 2161-0940. <http://doi:10.1007/s11033-024-09329-4>.
5. Keshavarzi Z, Rezapour T, Vatanchian M, Hesari M, Haghighi H, Izanlu, M, Sabaghian M and Shahveisi K. The effects of aqueous extract of Aloe vera leaves on the gastric acid secretion and brain and intestinal water content following acetic acid- induced gastric ulcer in male rats. Avicenna journal of phytomedicine.2014; 4(2):137-43.
<http://doi.10.22038/ajp.2014.1909>
6. Surjushe A, Vasani R and Saple DG. Aloe vera: a short review. Indian J Dermatol. 2008;53(4):163-6. [http://doi: 10.4103/0019-5154.44785](http://doi:10.4103/0019-5154.44785).
7. Ahmad A, Husain A, Mujeeb M, Khan SA, Najmi AK and Siddique NA. A review on therapeutic potential of Nigella sativa: A miracle herb. Asian Pac J Trop Biomed.2013;3(5): 337-352.
[http://DOI: 10.1016/S2221-1691\(13\)60075-1](http://DOI:10.1016/S2221-1691(13)60075-1)
8. Okon J E and Egesie G U. Gastrin, Histamine Prostaglandin: Indicators for assessing efficacy of cimetidine, Omeprazole and Ranitidine in Gastric Ulcer Treatment. Janaki Medical College Journal of Medical Science.2018; 5(2):5–12.
<https://doi.org/10.3126/jmcjms.v5i2.19011>.
9. Abdel Khaleq, Dalia, Omar, Ebtessam. The effect of olive oil and pomegranate peels on rats suffering from chronic liver injury. Journal of Home Economics, Menoufia

- University, 2018; 28(2): 1-23. <http://doi.10.21608/mkas.2018.157419>.
10. Sahloul, Talaat, El-Bishouti, Dina, Shanshan, Naglaa, El-Arian, Samah. The effect of pomegranate peels and juice on mice with hypercholesterolemia. *Journal of Home Economics*, Menoufia University, 2022; 32(1): 122-141. <http://doi.10.21608/mkas.2021.110690.1099>
 11. Khedr, Abeer, Youssef, Heba, and El-Keshky, Menna. Utilization of Pomegranate Peel Waste in Reducing the Risk of Hepatotoxic Rats by Ccl4. *Journal of Home Economics*, Menoufia University, 2023; 33(03): 53-66. <http://doi.10.21608/mkas.2023.201887.1218>.
 12. Akuru EA, Mpendulo CT, Oyeagu C and Nantapo C. Pomegranate (*Punica granatum* L.) peel powder meal supplementation in broilers: effect on growth performance, digestibility, carcass and organ weights, serum and some meat antioxidant enzyme biomarkers. *Ital. J. Anim. Sci.* 2021; 20(1): 119-131. <http://DOI:10.1080/1828051X.2020.1870877>
 13. Talaat R, Abdel-Hakem N, El-Toumy S, Samaka R, Mohamed A and El-Shahat M. Anti-angiogenic and Anti-Inflammatory Activity of *Punica granatum* Peel on Experimentally - Induced Gastric Ulcer in Rats. *International Journal of Biological Chemical Sciences* .2014;5:42–56. <https://www.cabidigitallibrary.org/doi/full/10.5555/20143350582>
 14. Chauhan I, Sharma A, Gangwar M, Gautam M, Singh A and Goel A. Gastric antiulcer and ulcer healing effects of *Punica granatum* L. Peel extract in rats: role of offensive and defensive mucosal factors and oxidative stress. *Int J Pharm Pharm Sci.* 2017; 9:6–11. <http://DOI:10.22159/ijpps.2017v9i5.9851>
 15. Ifora I, Hasyim N and Kardela W. Cyclooxygenase-2 inhibitory effect and anti-inflammatory activity of pomegranate (*punica granatum* L.) rind extract. *Int. Journal of Pharmaceutical Sciences and Medicine (IJPSM).* 2020;5(8):17-22. <https://www.academia.edu/44002219/>
 16. Hou K, Wu ZX, Chen, XY, Wang J, Zhang D, Xiao C, Zhu D, Koya J, Wei L, Li J and Chen Z. Microbiota in health and diseases. *Sig Transduct Target Ther* .2022;7: 135. <https://doi.org/10.1038/s41392-022-00974-4>.
 17. Boltin D. Probiotics in *Helicobacter pylori*-induced peptic ulcer disease. *Best Pract Res Clin Gastroenterol*. 2016;30(1):99-109. <http://doi:10.1016/j.bpg.2015.12.003>.
 18. Eamlamnam K, Patumraj S, Visedopas N and Thong-Ngam D. Effects of Aloe vera and sucralfate on gastric microcirculatory changes, cytokine levels and gastric ulcer healing in rats. *World journal of gastroenterology.* 2006; 12(13): 2034–2039. <https://doi.org/10.3748/wjg.v12.i13.2034>.
 19. Kushwaha SC, Bera M and Kumar P. Extraction of polyphenols from fresh pomegranate peel using response surface methodology. *Asian Journal of Chemistry.* 2015; 27(12): 4320. <http://dx.doi.org/10.14233/ajchem.2015.19051>
 20. Ghimire A, Paudel N and Poudel R. Effect of pomegranate peel extract on the storage stability of ground buffalo (*Bubalus bubalis*) meat. *LWT.* 2022; 154:112690. ISSN 0023-6438. <https://doi.org/10.1016/j.lwt.2021.112690>.
 21. Gil M I, Tom´as-Barber´an F A, Hess-Pierce B, Holcroft D M and Kader A A. Antioxidant activity of pomegranate juice and its relationship with phenolic composition and processing. *Journal of Agricultural and Food Chemistry.* 2000; 48(10): 4581–4589. <http://DOI:10.1021/jf000404a>
 22. Huang C, Chen Y, Chuan Wang D, Chiu C, Lin W, Huang C and Hsu M. Cytoprotective Effect of American Ginseng in a Rat Ethanol Gastric Ulcer Model. *Molecules* 19, 316-326. In bioactive lipids. *Food Res. Int.* 2014;65: 445–452. <https://doi.org/10.3390/molecules19010316>
 23. Bancroft JD, Stevens A and Turner DR. (1996): "Theory and Practice of Histological Techniques", Fourth Ed. Churchill Livingstone, New York, London, San Francisco, Tokyo. <https://www.sciencedirect.com/book/9780443102790/>
 24. AIN, (American Institute of Nutrition) Purified diet for Laboratory Rodent, Final report. *J. Nutrition.* 1993;123(11):1939-1951. <https://doi.org/10.1093/jn/123.11.1939>

25. Uchida M, Shimizu K and Kurakazu K. Yogurt containing *Lactobacillus gasseri* OLL 2716 (LG21 yogurt) accelerated the healing of acetic acid-induced gastric ulcer in rats. *Biosci Biotechnol Biochem.* 2010;74(9):1891-4. <http://doi:10.1271/bbb.100287>.
26. Moghaddam, G.; Sharifzadeh, M.; Khanavi, M.; Hajimahmoodi, M. Anti-Ulcerogenic activity of the pomegranate peel (*Punica granatum*) methanol extract. *Food and Nutrition Sciences.* 2013;04(10A): 43-48. <http://DOI:10.4236/fns.2013.410A008>
27. A.O.A.C. International Official Methods of Analysis, 19th ed., Gaithersburg.2012.
28. McDonald S, Prenzler P D, Antolovich M and Robards K. Phenolic content and antioxidant activity of olive extract. *Food Chem.*2001; 73: 73–84. [https://doi.org/10.1016/S0308-8146\(00\)00288-0](https://doi.org/10.1016/S0308-8146(00)00288-0)
29. Miliauskas G, Venskutonis PR and VanBeek TA. Screening of radical scavenging activity of some medicinal and aromatic plant extracts. *Food Chemistry.*2004; 85 (2):231-237. <http://DOI:10.1016/j.foodchem.2003.05.007>
30. Stroev E A. and Makarova V G. Laboratory Manual in Biochemistry, MIR Publishers, Moscow, USSR.1989. ISBN: 5030007679, 9785030007670. https://www.google.com.eg/books/edition/Laboratory_Manual_Of_Biochemistry/
31. Debnath PK, Gode KD, Das DG and Sanyal AK. Effects of propranolol on gastric secretion in albino rats. *Br J Pharmacol.* 1974 ;51(2):213-6. <http://doi:10.1111/j.1476-5381.1974.tb09649.x>. PMID: 4451741;
32. Robert A, Nezamis JE and Philips JB. Effect of prostaglandin E1 on gastric secretion and ulcer formation in rats. *J. Gastroenterol.*1968; 55: 481-487. [https://doi.org/10.1016/S0016-5085\(19\)34024-7](https://doi.org/10.1016/S0016-5085(19)34024-7)
33. Balaky STJ. Anti-H. pylori, anti-secretory and gastroprotective effects of *Thymus vulgaris* on ethanol-induced gastric ulcer in Sprague Dawley rats. *PLoS One.* 2024 Jan 25;19(1):e0287569. doi:10.1371/journal.pone.0287569. Retraction in: *PLoS One.* 2025 Jun 12;20(6):e0326248. <doi:10.1371/journal.pone.0326248>.
34. Hano J, Bogajske J, Danek L and Wantuch C. Effect of neuroleptic on the development of gastric injury related to oxidation, stress and lipid peroxidation rats Laboratory investigation. *Pol. J. Pharmacol. Pharm.*1976; 80 (8): 161-169. <https://europepmc.org/article/med/1264858>
35. Ohara A S, Sugiyama H, Hoshino E, Hamajima H and Goto F. Reduction of adverse effects of indomethacin by antiallergic drugs in rat stomachs. *Arzneimittelforschung.*1992; 42(9): 1115-1118. <https://pubmed.ncbi.nlm.nih.gov/1359896/>
36. Armitage P and Berry G. Statistical Methods, Method in Medical Research. Blackwell, Oxford. Statistics in Medicine.1987;559. <https://doi.org/10.1007/978-981-13-0827-7>
37. Tahooun N A and El Sheikh N A. Effect different levels of powder and aqueous extract of artichoke leaves on gastric ulcer. *World Journal of Dairy & Food Sciences.* .2016;11 (2): 131-140. <https://doi.org/10.5829/IDOSI.WJDFS.2016.11.2.1159>
38. Malik TF, Gnanapandithan K and Singh K. Peptic Ulcer Disease. 2023 Jun 5. In: StatPearls [Internet]. Treasure Island (FL): StatPearls .2023.PMID: 30521213. <https://pubmed.ncbi.nlm.nih.gov/30521213/>
39. Ismael S M, Al-Sayed H M A, Abdelrahman RA and Marwa F M. Protective effect of Aloe vera gel extract plant on liver diseases of experimental rats. *African J. Biol. Sci.*2018;14 (1): 61-77. <http://doi.10.21608/ajbs.2018.65276>
40. Nna VU, Akpan U P, Olubobokunl T, Osim EE and Antai AB. Crude Aloe vera gel increases body weight and reduces small intestinal transit in normal albino wistar rats. *J. Sci. Res. Rep.*2013; 2(2): 741-753. <http://DOI:10.9734/JSRR/2013/5489>
41. Gupta A and Swati R. Clinical importance of aloe vera: Review. *Research J. Topical and Cosmetic Sci.* 2017;8(1): 30-39. <http://DOI:10.5958/2321-5844.2017.00004.8>
42. Aziz F and Al-badry M. Efficacy Of Pomegranate Peel (*Punica Granatum*) Extract On Gastric Ulceration Induced Experimental Rats. *Biochem. Cell. Arch.*2019; 19(2): 2865-2871. <http://DOI:10.35124/bca.2019.19.2.2865>

43. Li Y C, Gou J, Yang J, Wei J, Xu E and Cheng S. Evaluation of antioxidants properties of pomegranate peel extract in comparison with pomegranate pulp extract. Food Chemistry.2006; 96: 254-260. <https://doi.org/10.1016/j.foodchem.2005.02.033>
44. Kulkarni A P, Mahal H S, Kapoor S and Aradhya S M. In vitro studies on the binding, antioxidant and cytotoxic actions of punica lagin. J. Agric. Food Chem.2007; 55(4): 1491-1500. <https://doi.org/10.1021/jf0626720>
45. Heeba, G H, Hassan M KH and Amin R S. Gastro protective effect of simvastatin against indomethacin induced gastric ulcer in rats. Role of nitric oxide and prostaglandins. Euro. J. Pharmacol.2009; 607: 188-193. [HTTP://DOI: 10.1016/j.ejphar.2009.02.008](http://doi:10.1016/j.ejphar.2009.02.008)
46. Larrosa M, Gonzalez-Sarrias A, Yanez-Gascon M J, Selma M v, Azorin-Ortuno M, Toti S, Tomas-Barberan F, Dolara P and Espin J C. Anti-inflammatory properties of a pomegranate extract and its metabolite urolithin-A in a colitis rat model and the effect of colon inflammation on phenolic metabolism. J. Nutr. Biochem.2009, 21(8): 717-725. <http://doi:10.1016/j.jnutbio.2009.04.012>
47. Haque MI, Ahmad N and Miah MA. Comparative analysis of body weight and serum biochemistry in broilers supplemented with some selected probiotics and antibiotic growth promoters. J. Adv. Vet. Anim. Res.2017;4(3): 288–294. <http://doi.org/10.5455/javar.2017.d226>
48. Sultana MA, Habib MA, Amin MN, Sabuz SH, Salma U, Begum MD and Haque MA. Effects of yogurt on growth performance, carcass traits, lipid profile and fecal microbial load of broiler chickens. International Journal of Agriculture and Biosciences.2025; 14(1): 50-58. <http://DOI:10.47278/journal.ijab/2024.196>
49. Sheval FM, Qerim IS, Kasum R and Isa RE. Chronic Effects of Lead Exposure on Oxidative Stress Biomarkers in Feral Pigeon (*Columba livia*) from Smelter Area in Kosovo. Jordan J Biol Sci.2020; 13 (3) : 589 – 595. <https://jjbs.hu.edu.jo/files/vol13/Supplementary%20Issue/Paper%20Number%203.pdf>
50. Adriani L, Latipudin D, Balia RL and Widjastuti T. Improvement of Small Intestine Morphometry in Broiler Chicken Using Fermented Cow and Soymilk as Probiotic. International J Pakistan Sci.2019; 18 (8): 255-259. [HTTP://DOI: 10.3923/ijps.2019.255.259](http://DOI:10.3923/ijps.2019.255.259)
51. Adriani L and Mushawwir A. Correlation Between Blood Parameters, Physiological and Liver Gene Expression Levels in Native Laying Hens Under Heat Stress. IOP Conf. Series: Earth Env Sci.2020; 466:1-7. [HTTP://DOI 10.1088/1755-1315/466/1/012015](http://DOI10.1088/1755-1315/466/1/012015)
52. Toghyani M, Mosavi SK, Modaresi M and Landy N. Evaluation of kefir as a potential probiotic on growth performance, blood biochemistry and immune responses in broiler chicks. Animal Nut.2015; 1(3) : 305–309. <https://doi.org/10.1016/j.aninu.2015.11.010>
53. Setyaningrum S, Siregar DJS and Pradana TG. Combination of gembili tuber and Lactobacillus plantarum on the performance, carcass, hematological parameters, and gut microflora of broiler chickens. Advances in Animal and Veterinary Sciences.2023; 11(2): 203-210. <http://DOI:10.17582/journal.aavs/2023/11.2.203.210>
54. Khan SH, Yousaf B, Mian AA, Rehman A and Farooq MS. Assessing the effect of administering different probiotics in drinking water supplement on broiler performance, blood biochemistry and immune response. Journal of Applied Animal Research.2011; 39(4): 418-428. <http://doi.10.1080/09712119.2011.623783>
55. Thilavech T, Chumroenvidhayakul S, Chusak C, Thunyakitpisal P and Adisakwattana S. The effect of Aloe vera juice and acemannan on postprandial lipemic, antioxidant, and inflammatory response in high-fat meal fed overweight/obese men: A randomized crossover-controlled study, Journal of Functional Foods.2024; 113:106015. <https://doi.org/10.1016/j.jff.2024.106015>
56. Lotfy L and Alamri E. The Impact of Pomegranate Peel-fortified Cupcakes on Weight Loss. Int.J. Pharm. Res. Allied Sci. 2019; 8(3):119-125. <https://ijpras.com/storage/models/article/4VsudgKUaRbrKFrEOS3dnmIS5b8GLrIrEfEe3Jksu9Mc15Qus13IzhutyZ8h/the-impact-of->

- [pomegranate-peel-fortified-cupcakes-on-weight-loss.pdf](#)
57. Soliman SM, Shoukry MM, El-Okazy AM, El-Morsy, MA and Soliman MM. The effect of pomegranate peel on soybean meal protein degradation and milk production in dairy cows. *Adv. Anim. Vet. Sci.* 2022;10(6):1350-1361. <https://dx.doi.org/10.17582/journal.aavs/2022/10.6.1350.1361>
 58. Gopinathan S. Evaluation of anti-ulcer activity of aloe vera juice in combination with papaya fruit and flower juices in experimental rats. *Int J Pharma & Technol.* 2013; 4: 4676-4988. <https://www.researchgate.net/publication/285206064>
 59. Rajendran A, Sobiya G and Gnanavel I. Study on the Effective Supplementation of Aloe vera Gel Antacid to Peptic Ulcer Patients. *Research Journal of Medicine and Medical Sciences.* 2008; 3(2): 132-134. <https://arnmsmb.com/old/rjmms/rjmms/2008/132-134.pdf>
 60. Niewiadomska J, Kumiega E, Plóciennik M, Gajek J, Noszczyk-Nowak A. Effects of *Punica granatum* L. peel extract supplementation on body weight, cardiac function, and haematological and biochemical parameters in an animal model of metabolic syndrome. *J Vet Res.* 2023 Jun 16;67(2):219–232. <http://doi.10.2478/jvetres-2023-0031>
 61. Mahmoud R, Mahfouz M, El-Sayed M, Mohamed H and Hassanien H. Constituents of pomegranate peel extract, and its ameliorative effect against the toxicity of vancomycin on the hematological parameters of male albino rats. *Sohag J. Sci.* 2024; 9(4): 440-447. <http://doi.10.21608/sjsci.2024.285713.1199>
 62. Al-Hadidi YIK. Antagonistic relationship between *Staphylococcus aureus* and species of the genus *Lactobacillus* in growth and production of toxins in some foods [master's thesis]. Tikrit (IQ): College of Agriculture, Tikrit University; 2011. https://www.tjas.org/article_44_b25a1209a5ef61aa26db75878bb55553.pdf
 63. Abudabos A, Murshed M, Qaid M and Abdelrahman G. Effect of probiotics on serum biochemical and blood constituents in chicken challenged with salmonella enterica subsp typhimurium. *Tropical Journal of Pharmaceutical Research.* 2016;15 (3): 461-467. <https://doi.org/10.4314/TJPR.V15I3.5>
 64. Marcia J, Gil M, Fernández H, Montero-Fernández I, Martín-Vertedor D, Yadav A and Aleman R S. Anti-Anemic and anti-dyspepsia potential of yogurt with caraao (cassia grandis) in rat model. *Fermentation.* 2024 10(4): 199. <http://doi:10.3390/fermentation10040199>
 65. Hoppe M, Önnings G and Hulthén L. Freeze-dried *Lactobacillus plantarum* 299v increases iron absorption in young females-Double isotope sequential single-blind studies in menstruating women. *PLoS One.* 2017 ;12(12):e0189141. <http://doi:10.1371/journal.pone.0189141>
 66. Salama W, Refaie A, Abo El-Azayem E, Bassiouni H and Mahrose k. Productive Impact of Beta Glucan And Aloe Vera Gel on Growing Rabbits. *J. Product. & Dev.*, 2025;30(1):1-12. <http://doi.10.21608/jpd.2025.399838>
 67. Zakrzewska Z, Zawartka A, Schab M, Martyniak A, Skoczko S, Tomasik PJ and Wedrychowicz A. Prebiotics, probiotics, and postbiotics in the prevention and treatment of anemia. *microorganisms.* 2022; 10(7):1330. <http://doi:10.3390/microorganisms10071330>
 68. Ahmad A, Ahmed W, Iqbal S, Javed M, Rashid S and Lahtisham-ul-Haq. Prebiotics and iron bioavailability? Unveiling the hidden association - A review. *Trends in Food Science & Technology.* 2021;110:584-590. ISSN 0924-2244. <https://doi.org/10.1016/j.tifs.2021.01.085>
 69. Wang Y, Wu Y, Wang Y, Xu H, Mei X, Yu D, Wang Y and Li W. Antioxidant Properties of Probiotic Bacteria. *Nutrients* 2017;9(5):521. <http://doi:10.3390/nu9050521>
 70. Koker G, Sahinturk Y, Ozcelik Koker G, Coskuner MA, Eren Durmus M, Catli MM and Cekin AH. Improved gastrointestinal tolerance and iron status via probiotic use in iron deficiency anaemia patients initiating oral iron replacement: a randomised controlled trial. *Br J Nutr.* 2024;132(10):1308-1316. <http://doi:10.1017/S0007114524002757>

71. Barkhidarian B, Roldos L, Iskandar MM, Saedisomeolia A and Kubow S. Probiotic supplementation and micronutrient status in healthy subjects: A systematic review of clinical trials. *Nutrients*.2021; 13(9): 3001. <http://doi:10.3390/nu13093001>
72. Alotaibi N, Alotibi M, Younis U, Hussain G, Dawar K, Hareem M, Ghoneim A, Fahad S and Danish S. Zn-quantum dot biochar regulates antioxidants and nutrient uptake to improve rapeseed growth and yield in drought stress. *Plant Stress*.2024;11:100286. <https://doi.org/10.1016/j.stress.2023.100286>
73. Abozahra N, Albalawi A, Althobaiti N, Mohamed R and Diab A. Effects of pomegranate (*punica granatum*) peel methanolic extract dietary supplementation on oreochromis niloticus performance, blood health, intestine morphometry and immunity. *Egyptian Journal of Veterinary Sciences*.2023;54(7) :221-236. <http://DOI:10.21608/ejvs.2023.229779.1561>
74. Abdel Moneim A. Antioxidant activities of *punica granatum* (pomegranate) peel extract on brain of rats. *Journal of Medicinal Plants Research*.2012; 6(2): 195–199. <https://doi.org/10.5897/JMPR11.500>
75. Li Y C, Guo J, Yang J, Wei J Xu and Cheng S. Evaluation of antioxidant properties of pomegranate peel extract in comparison with pomegranate pulp extract. *Food Chemistry*.2016; 96(2), 254–260. <http://DOI:10.1016/j.foodchem.2005.02.033>
76. Ucci M, Di Tomo P, Tritschler F, Cordone VGP, Lanuti P, Bologna G, Di Silvestre S, Di Pietro N, Pipino C, Mandatori D, Formoso G and Pandolfi A. Anti-Inflammatory role of carotenoids in endothelial cells derived from umbilical cord of women affected by gestational diabetes mellitus. *Oxid. Med. Cell. Longev*.2019; 8184656. <http://doi: 10.1155/2019/8184656>
77. Ali SS, Ahsan H, Zia MK, Siddiqui T and Khan FH. Understanding oxidants and antioxidants: Classical team with new players. *J Food Biochem*.2020;44(3):e13145. <http://doi: 10.1111/jfbc.13145>
78. Hussein J, El-Bana MA, El-Naggar ME, Abdel-Latif, Y, El-Sayed SM and Medhat D. Prophylactic effect of probiotics fortified with aloe vera pulp nanoemulsion against ethanol-induced gastric ulcer. *Toxicol Mech Methods*.2021;31:699–710. <http://doi:10.1080/15376516.2021.1958112>
79. Liu C, Cui Y, Pi F, Cheng Y, Guo Y and Qian H. Extraction, purification, structural characteristics, biological activities and pharmacological applications of acemannan, a polysaccharide from *Aloe vera*: a review. *Molecules* .2019;24(8):1554. <http://doi:10.3390/molecules24081554>
80. Heś M, Dziedzic K, Górecka D, Jędrusek-Golińska A and Gujska E. *Aloe vera* (L.) Webb.: natural sources of antioxidants—a review. *Plant Foods for Human Nutrition*. 2019;74(3):255–265. <http://doi: 10.1007/s11130-019-00747-5>
81. Singh J, Kaur H P, Verma A, Chahal A S, Jajoria K, Rasane P, Kaur S, Kaur J, Gunjal M, Ercisli S, Choudhary R, Bozhuyuk M R, Sakar E, Karatas N and Durul M S. Pomegranate 3 peel phytochemistry, pharmacological properties, methods of extraction, and its application: a comprehensive review., *ACS Omega* .2023;8 (39) :35452–35469. <https://pubs.acs.org/doi/10.1021/acsomega.3c02586>
82. Das AK, Nanda PK, Chowdhury NR, Dandapat P, Gagaoua M, Chauhan P, Pateiro M and Lorenzo JM. Application of pomegranate by-products in muscle foods: oxidative indices, colour stability, shelf life and health benefits. *Molecules* .2021;26(2): 467. <http://doi:10.3390/molecules26020467>
83. Shams SG.E and Eissa RG. Amelioration of ethanol-induced gastric ulcer in rats by quercetin: Implication of Nrf2/HO1 and HMGB1/TLR4/NF-κB pathways. *Heliyon*.2022;8(10).e11159. <https://doi.org/10.1016/j.heliyon.2022.e11159>
84. Abdel-Kawi SH, Hashem KS, Saad, MK, Fekry G and Abdel-Hameed EMM . The ameliorative effects of cinnamon oil against ethanol-induced gastric ulcer in rats by regulating oxidative stress and promoting angiogenesis. *J Mol Histol*. 2022;53(3):573–587. <http://doi: 10.1007/s10735-022-10072-y>
85. Paulrayer A, Adithan A, Lee JH, Moon KH, Kim DG, Im SY, Kang CW, Kim NS and Kim JH. *Aronia melanocarpa* (Black Chokeberry) Reduces Ethanol-Induced Gastric Damage via

- Regulation of HSP-70, NF-Kb, and MCP-1 Signaling.2017; *Int J Mol Sci*.18(6):1195. <http://doi:10.3390/ijms18061195>
86. Liu B, Feng X, Zhang J, Wei Y and Zhao X. Preventive effect of Anji white tea favonoids on alcohol-induced gastric injury through their antioxidant effects in Kunming mice. *Biomolecules* .2019;9(4):137. <http://doi:10.3390/biom9040137>
 87. Ejtahed H, Mohtadi-Nia J, Homayouni-Rad A, Niafar M, Asghari Jafarabadi M, and Mofid V. Probiotic yogurt improves antioxidant status in type 2 diabetic patients. *Nutrition*.2012; 28(5):539-543. <http://doi:10.1016/j.nut.2011.08.013>
 88. El Bohi KM, Abdel-Motal SM, Khalil SR, AbdElaal MM, Metwally MM, Elhady WM. The efficiency of pomegranate (*Punica granatum*) peel ethanolic extract in attenuating the vancomycin-triggered liver and kidney tissues injury in rats. *Environ Sci Pollut Res*. 2021;28(6):7134–50. <http://doi:10.1007/s11356-020-10999-3>.
 89. Darabighane B, Zarei A, Shahneh ZA and Mahdavi A. A study on the effects of aloe vera gel on phagocytic ability of macrophages and blood parameters in broilers. *Poultry Sci*.2011; 90 (1): 128. https://www.researchgate.net/publication/281836793_A_study_on_the_effects_of_aloe_vera_gel_on_phagocytic_ability_of_macrophages_and_blood_parameters_in_broilers
 90. Hasan S, Abou-Rawash A and Bekheet M. Protective Role of an Aqueous Extract of *Punica Granatum* (Pomegranate) Peel on Lead-Induced Anemia In Rats. *Alexandria Journal of Veterinary Sciences* .2016;50 (1): 99-108. <http://doi:10.5455/ajvs.228349>
 91. Piracha, M.;Alam, S.;Farooq, H.; Zulfiqar, T.; Khan, F. and Zahra, M. Prophylactic anti-Ulcer Effect of *Punica Granatum* (Pomegranate) Peel and Seed Extract in Murine Peptic Ulcer Model. *Esculapio Journal of SIMS*. 2022.18(4):495-9. <http://DOI:10.51273/esc22.2518420>
 92. Alimi H, Mabrouk FH, Zouari N, Sakly M and Rhouma K. LC-ESI-MS phenolic contents assessment, antioxidant, and protective ability of *Punica granatum* root bark extract against ethanol-induced gastric ulcer in rats: in silico H⁺, K⁺-ATPase inhibitory pathway study. *Toxicology Research*.2023;12(2):189-200. <http://DOI:10.1093/toxres/tfad006>
 93. Sanpinit S, Wetchakul P Chonsut P, Ngamdokmai N, Ahmad A. and Warinhomhoun S. Repeated 28-day oral toxicological study and gastroprotective effects of *Nigella sativa* L. Oil (Shuhada) against ethanol-induced gastric mucosal injury in rats. *Nutrients*.2023;15(6):1532. <http://doi:10.3390/nu15061532>
 94. Rahman Z, Dwivedi D and Jena G. Ethanol-induced gastric ulcer in rats and intervention of tert-butylhydroquinone: involvement of Nrf2/HO-1 signalling pathway. *Hum Exp Toxicol*. 2020;39(4):547–562. <http://doi:10.1177/0960327119895559>
 95. Retiu A, Budescu T and Menae I. Aloe vera extract for stomach acid use safe and effective treatment. *International Journal Papier Advance and Scientifc Review*. 2021;2(2):59–64. <https://doi.org/10.47667/ijpasr.v2i2.125>
 96. Ahmed AH. Preventable effects of Aloe vera, nigella sativa, moringa oleifera oils and mixture of them on aspirin induced acute gastric ulcer in experimental rats. *Egypt J Nutr Health*. 2022;17(1):15–33. <http://doi.10.21608/ejnh.2022.259242>
 97. Karampour NS, Arzi, A, Rezaie A, Pashmforoosh M and Kordi F. Gastroprotective effect of zingerone on ethanol-induced gastric ulcers in rats. *Medicina*. 2019;55(3):64. <http://doi:10.3390/medicina55030064>
 98. Bakry, S.M.; Naser, A.F.A.; Negoumy, S.I.E.; Kassem,M.;Abdel-Sattar,E. and Meselhy,M.(2023):Phenolic acids-rich fraction from *Ficus drupacea* leaves for the prevention and treatment of ethanol-induced gastric mucosal injury in rats. *Inflammopharmacol* 31, 1423–1436. <https://doi.org/10.1007/s10787-023-01158-4>.
 99. Chauhan, I.; Agrawal, S. and Goel, R.K. Status of inflammatory markers and growth factor in gastric ulcer protective effects of *Punica granatum* L. peel extract in rat. *National Journal of Physiology, Pharmacy and Pharmacology*. 2018;8(1):12-.17. <https://njppp.com/fulltext/28-1490694416.pdf>

100. Ajaikumar K, Asheef M, Babu B and Padikkala J. The inhibition of gastric mucosal injury by Punica granatum L.(pomegranate) methanolic extract. Journal of Ethnopharmacology. 2005;96(1-2):171-6. <https://doi.org/10.1016/j.jep.2004.09.007>
101. Silla A, Punzo A, Bonvicini F, Perillo M, Malaguti M, Lorenzini A, et al. Antioxidant and antibacterial properties of tomato skin and pomegranate peel extracts: a sustainable approach for oral health care. Antioxidants.2025;14(1): 54. <https://doi.org/10.3390/antiox14010054>
102. Mohamed A, Abd-Elghafar S, Mousa R and Kamel A. Aloe vera gel confers therapeutic effect by reducing pyroptosis in ethanol-induced gastric ulcer rat model: Role of NLRP3/GSDMD signaling pathway. Molecular Biology Reports.2024; 51(1):401. <http://doi:10.1007/s11033-024-09329-4>
103. Rajasekaran S, Sivagnanam K and Subramanian S. Antioxidant effect of Aloe vera gel extract in streptozotocin-induced diabetes in rats. Pharmacol Rep PR.2005; 257(1):90–6. https://www.researchgate.net/publication/7889031_Antioxidant_effect_of_Aloe_vera_gel_extract_in_streptozotocin_diabetes_in_rats
104. Chelu M, Musuc A M, Popa M and Calderon Moreno J. Aloe Vera-based hydrogels for wound healing: properties and therapeutic effects. Gels.2023;9(7): 539. <http://doi:10.3390/gels9070539>
105. Risau W. (1997): Mechanisms of angiogenesis. Nature.1997;386(6626): 671–674. <http://doi.org/10.1038/386671a0>
106. Akbarian M, Bertassoni L E and Tayebi L. Biological aspects in controlling angiogenesis: current progress. Cellular and Molecu. life scie.2022; 79(7): 349. <http://doi:10.1007/s00018-022-04348-5>
107. Builders MI, Udeh BO, Ede SO, Joseph SO and Ise PU . Evaluation of anti-ulcer activity of methanolic extract Combretum paniculatum Vent. in rats and mice using pylorus–ligation induced model. Open Access Research Journal of Life Sciences.2023;05(02),:010–020. : <https://doi.org/10.53022/oarjms.2023.5.2.023>
108. Asif M, Zahid T, Ahmad B, Yasmeen T and Imran M. Therapeutics characteristics and application of Aloe vera: a review. RADS J Food Biosci .2023;2:56–64. <https://jfbbs.juw.edu.pk/index.php/jfbbs/article/view/20/61>
109. Mohamed MS and Mabrok HB. protective effect of pomegranate peel powder against gastric ulcer in rats. Biointerface Res Appl Chem.2021; 12:4888-99.
110. Yang Z, Zhou Y, Han Z, He K, Zhang Y, Wu D, Chen H. The effects of probiotics supplementation on Helicobacter pylori standard treatment: an umbrella review of systematic reviews with meta-analyses. Sci Rep. 2024;14:10069. (<https://doi.org/10.1038/s41598-024-59399-4>).
111. Khoder G, Al-Menhali A, Al-Yassir F and Karam S. Potential role of probiotics in the management of gastric ulcer (Review). Exp Ther Med.2016;12 (1):3-17. <http://doi:10.3892/etm.2016.3293>
112. Nishida A, Nishino K, Ohno M, Sakai K, Owaki Y, Noda Y and Imaeda H. Update on gut microbiota in gastrointestinal diseases. World J Clin Cases. 2022 Aug 6;10(22):7653-7664. <http://doi:10.12998/wjcc.v10.i22.7653>
113. Rizzo G, Pineda Chavez S, Vandenkoornhuys E, Cárdenas Rincón C, Cento V, Garlatti, V et al. Pomegranate extract affects gut biofilm forming bacteria and promotes intestinal mucosal healing regulating the crosstalk between epithelial cells and intestinal fibroblasts. Nutrients. 2023;15(7):1771. <http://doi:10.3390/nu15071771>
114. Pierdomenico M, Riccioni C and Benassi B. Anti-inflammatory effect of a pomegranate extract on LPS stimulated HepG2 cells. Natural Product Research.2023;1-8. <http://doi:10.1080/14786419.2023.2196622>
115. Colombo E, Sangiovanni E and Dell’Agli M. A review on the anti-inflammatory activity of pomegranate in the gastrointestinal tract. Evidence-Based Complementary and Alternative Medicine.2013 ;2013:247145. <http://doi:10.1155/2013/247145>.
116. Baradaran Rahimi V, Ghadiri M, Ramezani M and Askari ,V.R. Antiinflammatory and anti-cancer activities of pomegranate and its

- constituent, ellagic acid: Evidence from cellular, animal, and clinical studies. *Phytotherapy research*. 2020;34(4):685-720. <http://DOI:10.1002/ptr.6565>
117. Ahmed, M. and Hussain, F. (2013): Chemical composition and biochemical activity of Aloe vera (*Aloe barbadensis miller*) leaves. *Int. J. Chem. Biochem. Sci.* 3: 29-33. <https://www.iscientific.org/wp-content/uploads/2020/05/4-IJCBS-13-03-04.pdf>
 118. Muhialdin AJ, Alamri ZZ, Hussein AM, Faraj RK, Taha ZB, Hussein MM and Mojarradgandoukmolla S. Gastro-Protective and therapeutic effect of punica granatum against stomach ulcer caused by helicobacter pylori. *Cellular and Molecular Biology*. 2023;69(1):48-53. <http://doi:10.14715/cmb/2022.69.1.9>.
 119. Alam M, Ahmad M, Najmi A, Asif M and Ahmad S. Aqueous methanolic extract of Punica granatum protect against alcohol induced gastric ulcer in rats. *NPAIJ*. 2008;4(1):91-94. <https://www.tsijournals.com/articles/aqueous-methanolic-extract-of-punica-granatum-protect-against-alcohol-induced-gastric-ulcer-in-rats.pdf>
 120. Zedan I, Alkattan Land AL-Mahmood S. Immunological and histopathological changes after topical application of aloe vera leaf extract during ventral hernioplasty in rams. *Assiut Vet. Med. J.* 2025;71 (184): 376-385. <http://doi:10.21608/avmj.2025.308871.1331>
 121. Dong X, Zeng Y, Liu Y, You L, Yin X, Fu J and Ni J. Aloe-emodin: A review of its pharmacology, toxicity, and pharmacokinetics. *Phytotherapy rese.:* PTR.2020;34(2):270–281. <http://doi:10.1002/ptr.6532>.
 122. Kiss A K and Piwowarski JP. Ellagitannins, gallotannins and their metabolites—the contribution to the anti-inflammatory effect of food products and medicinal plants. *Curr. Med. Chem.* 2019; 25(37): 4946–4967. <http://DOI:10.2174/0929867323666160919111559>
 123. Chauhan I, Sharma A, Gangwar M, Gautam MK, Singh A and Goel RK. Gastric antiulcer and ulcer healing effects of Punica granatum L. Peel extract in rats: Role of offensive and defensive mucosal factors and oxidative stress. *Int J Pharm Pharm Sci.* 2017; 9:6-11. <http://DOI:10.22159/ijpps.2017v9i5.9851>
 124. Elliott SN, Buret A, McKnight W, Miller MJ and Wallace JL: Bacteria rapidly colonize and modulate healing of gastric ulcers in rats. *Am J Physiol.* 1998; 275:G425–G432. PubMed/NCBI. <http://DOI:10.1152/ajpgi.1998.275.3.G425>



مجلة الاقتصاد المنزلي، جامعة المنوفية

<https://mkas.journals.ekb.eg>

الترقيم الدولي اون لاين الترقيم الدولي للطباعة

2735-5934 2735-590X

تاريخ الاستلام: ٥ فبراير ٢٠٢٥

تاريخ القبول: ١٦ مارس ٢٠٢٥

تاريخ النشر: ١ أبريل ٢٠٢٥

نوع المقالة: بحوث أصلية
التغذية وعلوم الاطعمة

تأثير التدخل الغذائي بالرمان والصبار في تخفيف اعراض قرحة المعدة المستحثة بالكحول في فئران التجارب

مي غريب، منى زايد، سهام خضر

قسم التغذية وعلوم الأطعمة، كلية الاقتصاد المنزلي، جامعة المنوفية، شبين الكوم، مصر.

* المؤلف المسئول: مي غريب - البريد الإلكتروني: mai.ghareb@hec.menofia.edu.eg

الملخص العربي:

يتميز مرض القرحة الهضمية بتقرحات و التهابات في المعدة والاثنى عشر، وغالبًا ما ترتبط بالإجهاد التأكسدي والالتهاب. هدفت هذه الدراسة إلى تقييم التأثير العلاجي لخليط معزز بمستخلص قشر الرمان وجيل الصبار في نموذج قرحة مستحث تجريبياً في الفئران البينو. تم تقسيم خمسة وثلاثين فأراً ذكراً بالغاً إلى مجموعة تحكم سلبية ومجموعات مستحثة بالقرحة، تلقت جرعة فموية واحدة من الكحول الإيثيلي بنسبة 10 مل / كجم من وزن الجسم، وتم تقسيمها عشوائياً إلى أربع مجموعات فرعية؛ والتي تلقت علاجات مختلفة: 200 مجم / كجم من الصبار (AVG)، و 50 مجم / كجم من الرمان (PMG)، ومجموعة مشتركة من الصبار والرمان (APG). أظهرت النتائج أن التدخلات الغذائية حسنت بشكل كبير من مؤشرات صورة الدم ومضادات الأكسدة. أظهرت مجموعة APG أعلى مستويات الهيموجلوبين (0.70 ± 12.25 جم / ديسيلتر) وعدد خلايا الدم الحمراء (0.59 ± 7.03)، مما يدل على تحسن كبير مقارنة بمجموعة التحكم الموجبة. كما تم تعزيز نشاط مضادات الأكسدة، مع أعلى مستوى من سوبر اكسيد الدسميوتاز (SOD) (0.55 ± 25.03 وحدة / مل) وانخفاض مستويات مالونديالدهيد (MDA) (0.53 ± 1.54 نانومول / مل) في APG. كان مؤشر تثبيط القرحة هو الأعلى في APG (44.14 ± 359.71)، إلى جانب أعلى معدل حماية (5.24 ± 60.17 %) وأقل نسبة تقرح (5.89 ± 35.87 %). تسلط هذه النتائج الضوء على التأثيرات الوقائية لصبار الألوفيرا ومستخلص قشر الرمان في تقليل تقرح المعدة وتعزيز دفاع مضادات الأكسدة وتعزيز التئام القرحة. وأظهر العلاج الخليط الفوائد العلاجية الأكثر تأثيراً، مما يشير إلى إمكانية استخدامه كاستراتيجية طبيعية للتخفيف من قرحة المعدة وتحسين صحة الجهاز الهضمي.

الكلمات الكاشفة: المعدة، البريبايوتيك، مضادات الأكسدة، الالتهاب، مؤشر الحماية، درجة التقرح

الاستشهاد الي:

Gharib et al., 2025, The effect of dietary intervention with pomegranate and aloe vera in alleviating the symptoms of alcohol-induced stomach ulcers in experimental rats. JHE, 35 (2), 57-84. DOI: 10.21608/mkas.2025.365849.1373