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BIO Evaluation The Protective Anti-Anemia Physiological Role Of *Apium graveolens* And *Eruca sativa* Leaves Aqueous Extract In Anemic Albino Rats

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Abstract:

Hemolytic anemia is a common form of anemia due to hemolysis, which leads to iron deficiency. This study aimed to evaluate the anti-anemic protective physiological role of *Apium graveolens* aqueous extract in albino rats with anemia induced by phenyl hydrazine (PHZ). The current study investigates the effect of *Apium graveolens* aqueous extract on some markers of oxidative stress, and its relationships with anemia in male albino rats. In this study, a dose of 60 mg/kg of phenyl hydrazine (PHZ) was injected into rats to establish a clear animal model of anemia, which led to anemia development. The effective dose of the aqueous extract of *A. graveolens* was determined by dividing 9 rats into 3 groups. The first group was given the aqueous extract of *A. graveolens* at a dose of 75 mg/kg, the second group *A. graveolens* at the dose (150 mg/kg) and the third group was given *A. graveolens* at a dose (250 mg / kg). The effective dose of the aqueous extract of *A. graveolens* was (150 mg /kg).Then 45 rats were randomly divided into 9 groups, the positive control group (A) which was prepared by following a standard diet or group Anemia model is an negative control (B), in which anemia was developed, and the rats of the hardening was divided into 7 groups, which are (C) dosed (*A. graveolens* extract at a concentration of 150 mg/kg), group (D) dosed with aqueous extract of E. sativa (250 mg / kg), group (E) dosed with aqueous extract of *A. graveolens* (150 mg/kg) and *E. sativa* (250 mg/kg), group (F) Dose A. graveolens extract at a concentration of 150 mg/kg, E. sativa 250 mg/kg, and iron 4 mg/kg),the (G) group injected with (PHZ) 60 mg/kg and after an hour was given to the aqueous extract dose of *A. graveolens* 150 mg/kg) orally by Gavage for 30 days. the (H) group injected with (PHZ) 60 mg/kg and after an hour was given to the aqueous extract dose of *E. sativa* 250 mg/kg) orally by Gavage for 30 days. and group (I) Dose iron 4 mg/kg) orally by Gavage for 30 days.

The data of this study showed that there were statistically significant differences in the level of (SOD) and (GPX) values between the group treated with aqueous extract of *A. graveolens* at a dose of 150 mg/kg and the negative control group. While the level of (GSH) increased compared to the negative control, A. graveolens extract can cause a significant decrease in (MDA) concentration compared to the negative control group . The aim of this study was to review the antioxidant activity of *Apium graveolens*.

Key wards. Anemia, phenyl hydrazine (PHZ), *Apium graveolens* , antioxidant (enzymes), (GSH) ,(SOD), (GPX)- oxidative stress,(MDA) .

تقييم الدور الفسيولوجي الوقائي المضاد لفقر الدم للمستخلص المائي لأوراق الكرفس والجرجير في الفئران البيضاء المصابة بفقر الدم

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مستخلص:

فقر الدم الانحلالي هو شكل شائع من فقر الدم الناتج عن انحلال الدم، والذي يؤدي إلى نقص الحديد. هدفت هذه الدراسة إلى تقييم الدور الفسيولوجي الوقائي المضاد لفقر الدم لمستخلص الكرفس المائي في الجرذان البيضاء المصابة بفقر الدم الناتج عن فينيل هيدرازين. تبحث الدراسة الحالية في تأثير مستخلص الكرفس المائي على بعض مؤشرات الإجهاد التأكسدي، وعلاقته بفقر الدم لدى ذكور الجرذان البيضاء. في هذه الدراسة، حُقنت الجرذان بجرعة 60 ملغم/ كغم من فينيل هيدرازين (PHZ) لإنشاء نموذج حيواني واضح لفقر الدم، مما أدى إلى تطوره. حُددت الجرعة الفعالة لمستخلص الكرفس المائي بتقسيم 9 جرذان إلى 3 مجموعات. تم إعطاء المجموعة الأولى المستخلص المائي لـ *A. graveolens* بجرعة 75 ملغم/ كجم، والمجموعة الثانية *A. graveolens* بجرعة (150 ملغم/ كجم) والمجموعة الثالثة *A. graveolens* بجرعة (250 ملغم/ كجم). كانت الجرعة الفعالة للمستخلص المائي لـ *A. graveolens* هي (150 ملغم/ كجم). ثم تم تقسيم 45 فأرًا عشوائيًا إلى 9 مجموعات، المجموعة الضابطة الإيجابية (أ) والتي تم إعدادها باتباع نظام غذائي قياسي ومجموعة ضابطة سلبية (ب)، والتي تم فيها استحداث فقر الدم، وتم تقسيم فئران المنبقية إلى 7 مجموعات وهي (ج) التي تم تجريعها بجرعة (مستخلص *A. graveolens* بتركيز 150 ملغم/ كجم)، المجموعة (د) التي تم تجريعها بجرعة من المستخلص المائي لـ *E. sativa* (250 ملغم/ كجم)، المجموعة (هـ) التي تم تجريعها بجرعة من المستخلص المائي لـ *A. graveolens* (150 ملغم/ كجم) و *E. sativa* (250 ملغم/ كجم)، المجموعة (و) تم تناول جرعة من مستخلص *A. graveolens* بتركيز 150 ملغم/ كجم و *E. sativa* 250ملغم/ كجم وحديد 4 ملغم/ كجم)، المجموعة (ز) التي تم حقنها بـ (60 ملغم/ كجم) فينيل هيدرازين PHZ وبعد ساعة تم إعطاء جرعة من المستخلص المائي لـ *A. graveolens* (150ملغم/ كغم) عن طريق الفم عن طريق التغذية القسرية لمدة 30 يومًا. المجموعة (H) تم حقنها بـ (60 ملغم/ كجم) فينيل هيدرازين PHZ وبعد ساعة تم إعطاء جرعة من المستخلص المائي لـ *E. sativa* (250ملغم/ كغم) عن طريق الفم عن طريق التغذية القسرية لمدة 30 يومًا. والمجموعة (I) جرعة من الحديد (4 ملغم/ كغم) عن طريق الفم عن طريق التغذية القسرية لمدة 30 يومًا. أظهرت بيانات هذه الدراسة وجود فروق ذات دلالة إحصائية في مستوى قيم (SOD) و (GPX) بين المجموعة المعالجة بالمستخلص المائي لـ *A. graveolens* بجرعة 150 ملغم/ كغم ومجموعة التحكم السلبية. بينما ارتفع مستوى (GSH) مقارنةً بمجموعة التحكم السلبية، يمكن أن يسبب مستخلص *A. graveolens* انخفاضًا كبيرًا في تركيز (MDA) مقارنةً بمجموعة التحكم السلبية. هدفت هذه الدراسة الى مراجعة النشاط المضاد للأكسدة لنبات الكرفس *Apium graveolens*.

الكلمات المفتاحية: فقر الدم، فينيل هيدرازين (PHZ)، الكرفس، مضادات الأكسدة (الإنزيمات)، (GSH)، (SOD)، (GPX) – الإجهاد التأكسدي، (MDA) .

INTRODUCTION

Anemia : is a common public health problem in many developing countries. It can be defined as a state of low hemoglobin concentration and/or a decrease in the mass of red blood cells (RBC) in the blood. Resulting in a decrease in oxygen carrying capacity, these low levels of hemoglobin and RBCs may reduce the blood's ability to distribute oxygen to the various body systems. Thus, uncontrolled anemia may be dangerous or even life-threatening.[1, 2, 3 , 4] , anemia is not a diagnosis but a reflection of the underlying pathophysiological changes described by careful medical laboratory examinations of the patient , and can be Anemia causes serious complications such as impaired cognition and intellectual performance, weakened immune system, decreased ability to work, and common causes of anemia include nutritional deficiency, especially iron deficiency, and diseases that cause a lack of hemoglobin production (for example, iron deficiency, B12, or deficiency of Folic acid) or accelerating its destruction is often the result of a defect in the structure of hemoglobin, and thus affects the production of red blood cells. [5,6] .

For few centuries, herbs have been used extensively to treat a variety of ailments. Recently, the desire was still to use these plants as a first alternative to treat specific diseases in developing countries due to the lack of side effects resulting from them [7] and their basic nutritional value, physiological effect, and pharmaceutical substances, which led to a renewed interest in herbal medicine. Which considered complementary and alternative medicine [8, 9].

Medicinal plants have been considered a source of control for many diseases, and anemia is no exception, many plants are believed to be beneficial for anemia [10]. The search for new anti-anemias is an attractive topic of research by many scientists, including pharmacologists and pathologists. [11] Some phytochemicals or herbs act directly in the treatment of anemia, and others act in a multidirectional manner through their antioxidant activity, by increasing resistance to oxidative stress or by The way cellular mechanisms work, [12] The plants and their components are important natural sources that are used in the treatment of many diseases, without any side ef-

fects Therefore, recent results focus on these natural sources of treatment for many diseases, such as cytotoxicity, cardiovascular disease, and cancer. Many medicinal plants have been used in folk medicine to treat anemia, including plant ' *A. graveolens'*. is used to treat anemia. [13].(It is one of the medicinal herbal plants rich in flavonoids such as apigenin and apiein [14]. Apigenin is exceptionally useful for reducing blood flow, stenosis and hypertension [15] "*A. graveolens*" contains a lot of potassium and antioxidants and this makes *A. graveolens* suitable for the detoxification process [16]. The aqueous extract of *A. graveolens* contains phenol, which has the ability to remove free radicals. The leaves of *A. graveolens* are rich in phenol and are a good source of antioxidants [17].

Tissue damage caused by ROS is known as oxidative stress, while factors that can protect tissues from ROS are called antioxidants. Different tissues that can be damaged by ROS include DNA, lipids, and proteins. [18]. Oxidative stress is Imbalance between oxidizing mole or free radicals and antioxidants," and this imbalance may lead to the attack of all cell components by ROS and thus damage cells and cause disease. [19]. It is used to describe a number of chemical reactions involved in the production of reactive oxygen free radicals (ROS), such as monomers of oxygen (-0), superoxide radicals (-02), hydrogen peroxide (H_20_2), and hydroxyl radicals. OH) which are likely to cause cell injury when ROS production increases, they begin to show a detrimental effect on biological molecules such as lipids, proteins, nucleotides/DNA, and others. Contribute to a variety of diseases [20].

Antioxidants are molecules that inhibit the action of free radicals as well as prevent cellular damage. Antioxidants exist as both enzymatic and non-enzymatic molecules in the body. Enzymatic antioxidants work by metabolizing free radicals and removing them from cells. Most of these antioxidant enzymes convert reactive oxidizing species to hydrogen peroxide (O;H), and subsequently to water, in the presence of cofactors such as manganese, iron, zinc and copper in a multistep process. Non-enzymatic antioxidants act by interfering with or interrupting the free radical chain reaction [19].

MATERIALS AND METHODS

Experimental animals

This study was conducted in the animal house of the Iraqi Center for Cancer and Medical Genetics Research / Al-Mustansiriya University, during the period from 1/12/2020 to 15/2/2021, and the study included (30) white rats (Rattus Albino Rat) (*norvegicus*). is hard (8-12) weeks and weighs (200-300 g). The hardwoods were placed in an air-conditioned room at a temperature (20-25 °C), and the lighting system was secured (12 hours of daily light). The rats were placed in plastic cages covered with metal lids, with dimensions of (15, 30 and 40) cm. Each cage contains 5 rats, Each cage contains Wooden Shave. Water and ration were given in sufficient quantities. The rats were left for a week to acclimatize, and the cages were cleaned and evaded with ethanol alcohol (70 %)every week and regularly.

Experience Design

45 Rats were divided into nine groups of 5 rats/cage, and were treated as follows:

1- the positive control group (A) which was prepared by following a standard

2- Group (B) negative control injected with: (PHZ) (60 mg/ kg) in the peritoneal cavity

3- Group (C). which injected with: (PHZ) (60 mg/kg) to induce anemia. After a complete blood picture was examined to confirm that she had anemia, she was given a dose of aqueous extract of *Apium graveolens* at a dose (150 mg/kg) orally.

4- Group (D). which injected with: (PHZ) (60 mg/kg) to induce anemia, and after a complete blood picture was examined to confirm that she had anemia, she was given a dose of watercress aqueous extract (250 mg /kg) orally.

5- Group (E). which injected with: (PHZ) (60 mg /kg) to induce anemia, and after a complete blood picture was examined to confirm that she had anemia, she was given a dose of aqueous extract of *Apium graveolens* at a dose (150 mg/kg) and watercress (250 mg / kg), orally.

6- Group (F). which administered (PHZ 60 mg/kg) to induce anemia, and after a complete blood picture was examined to confirm that she had anemia, the doses were as follows (*Apium graveolens* extract at a concentration of

150 mg/kg, watercress 250 mg/kg and iron 4 mg/kg) orally.

7- Group (G). which injected with: (PHZ) (60 mg/kg), and after an hour, she was given a dose of aqueous extract of *Apium graveolens* at a dose of (150 mg/kg) orally.

8- Group (H). It was injected with: (PHZ) (60 mg/ kg), and after an hour it was given to the aqueous extract of watercress at a dose (250 mg/kg) orally

9- group (I). which given (PHZ 60 mg/ kg) to induce anemia, and after a complete blood count was done to confirm that she had anemia, she was given an iron vial of 4 mg/ kg, orally.

Collection of plants

The plant A. graveolens and *Eruca sativa* were obtained from a farm in Baghdad during the month of July of the year 2020, and the Department Republic of Iraq Ministry of Agriculture Directorate of seed Testing and certification (D.S.T.C.) Scientific classification of plant samples and their type.

Apium graveolens

After cleaning the good intentions, leave to dry in a dry and dark place at room temperature. After making sure that the samples are completely dry, they are ground using an electric grinder (Gosonic) and placed in the filter, taking into account the conditions of sterilization of tools, then the plant powder is kept in plastic containers until use.

Preparation of Aqueous Extract of Raw Plants

The aqueous extracts of *E. sativa* and *A. graveolens* were prepared according to Al-Saadoun, (2005) in the Central Animal Nutrition Laboratory, Advisory Office, College of Agricultural Engineering Sciences, University of Baghdad, Ministry of Higher Education and Scientific Research. [39]

(25 g) of each sample was used with (500 ml) of boiled distilled water and left for 30 minutes on the magnetic stirrer, and the solution was drained by a Buechner filter funnel using thin gauze, then filter paper (1. Whatman No) with vacuum and then left the center to dry at a temperature The temperature of the laboratory is (25 ^{o}m), then placed in dark bottles and kept in the refrigerator until use.

Oxidative Stress Parameters - Anti Oxidative

Estimation of The Level of Malondialdehyd (MDA) in The Blood Serum

The modified thiobarbituric acid - TBA reaction method used by the researchers [21] was used to measure the level of MDA.

Estimation of The Level of Glutathione in The Blood Serum

Serum glutathione was determined using the modified method [22].

Determination of The Level of Superoxide Dismutase (SOD) in The Blood Serum

The concentration of SOD in the serum was estimated using the ELISA test, according to the instructions contained in the examination kit supplied by the American company CUSABIO

Estimation of Glutathione Peroxidase in The Blood Serum

Serum glutathione Peroxidase was determined using the method [23].

Collections of Blood Samples:

At the end of the experiment, the animals were prevented from feeding for (24 hours), then the animals were taken by placing them in a sealed plastic container containing a piece of cotton moistened with chloroform and left until the animal stopped moving, then immediately placed on the dissection board, then blood samples were drawn from The heart was taken directly using a clean and sterile medical syringe (Heart Puncture), and (6-7) ml of blood was obtained for each animal, then the samples were placed in VACUUM TUBE (SST) Gel & Clot Activator 6 ml tubes that are free of anticoagulant for the purpose of separation the blood serum, then it is placed in an Eppendorf centrifuge at a speed of (3000) revolutions per minute for a period of 15 minutes to separate the blood serum . (-20^{o}m) until the examinations are conducted for the purposes of the study [24].

Statistical Analysis

The statistical program {SAS_ Statistical Analysis System (2012)} was used to analyze the data to study the effect of different treatments on the studied traits according to a "Completely Randomized Design" (CRD), and the significant differences between the means were compared with the test, (Last Significant Difference _ LSD). Correlation coefficient - r was also extracted between a number of studied traits. [25].

RESULTS & DISCUSSION

Effects of Values of The Variables of Malondialdehyde (MDA) Within Experimental Groups

In sum, the results of the current study, as shown in Fig (4-1), which included the oxidative stress values under study, which included (MDA) showed a highly significant increase ((P < 0.01)) in the values of the variable (MDA) studied for experimental animals in the affected control group Negative (B) when Treatment with the compound (PHZ) compared to the Positive control (A), while the results were the variable values (MDA) within the experimental anemia group (C) and the treatment with the aqueous extract of '*A. graveolens*' (dose concentration 150 mg /kg) showed a highly significant decrease ((P < 0.01)) compared with the negative control group (B).

The results of the study also included for group (E) treated with aqueous extract of *A. graveolens* (dose concentration 150 mg/ kg) and aqueous extract of" *E. sativa* "(dose concentration 250 mg/ kg). The values of the variable (MDA) showed a highly significant decrease((P < 0.01)) when Comparison with the Negative control group (B).

The results: of the study for group (F) treated with aqueous extract of *A. graveolens* (dose concentration 150 mg/ kg) and aqueous extract of *E. sativa* (dose concentration 250 mg/ kg) and iron (dose concentration 4 mg/ kg) indicated that the values of the variable (MDA). It showed a highly significant decrease (P<0.01) when compared with the Negative control group (B), as well as with regard to group (G). The results of the study indicated for the group and treatment with (PHZ) with the aqueous extract of *A. graveolens* (dose concentration 150 mg/ kg) that The values of the variable (MDA) showed a highly significant decrease (P<0.01) when compared with the Negative control group (B).

The results also showed that the highest value of the MDA variable Malone Aldehyde was for group (B), while the average concentration of the values of the variable (MDA) for the study groups were as follows: group (C) (6.33 ±0.13, group (D) (5.75 ± 0.18), group (E) (8.17 ±0.07), group (F) (9.61 0.26), while the mean concentrations of the positive control group (A) and the Negative control group (B) were (7.08 ±0.16) (12.07 ±0.18), respectively.

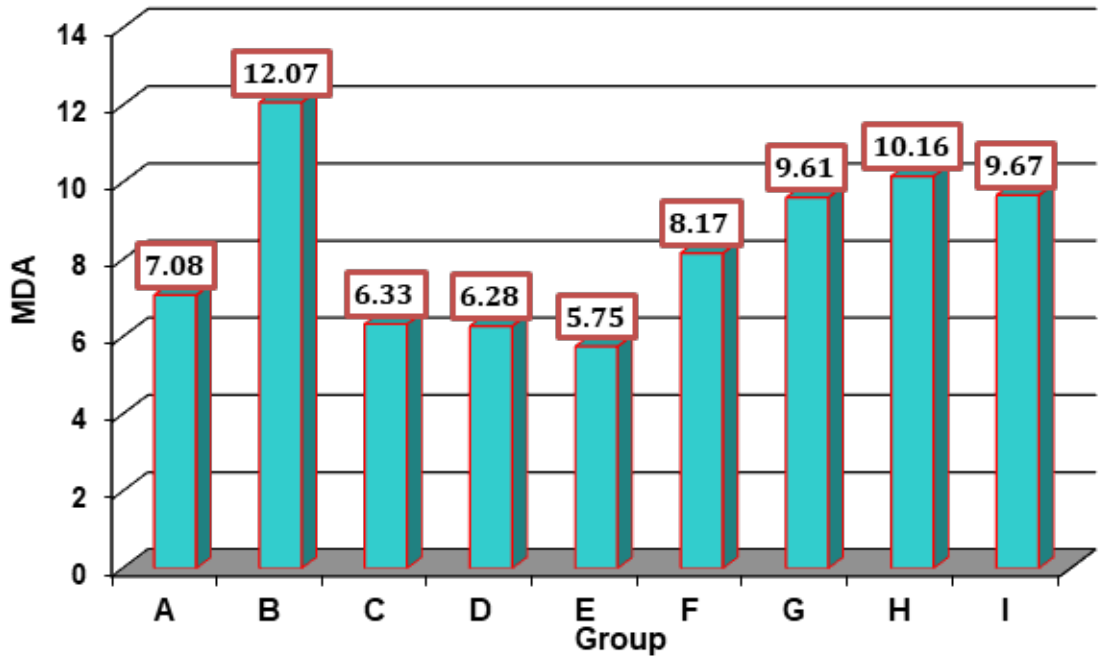


FIGURE (4-1) Compare between difference groups in MDA

Elevated levels of reactive oxygen species in the body ,along with the capacity of the antioxidant system lead to a state of oxidative stress. A major consequence of oxidative stress is cell damage caused by lipid membrane-attacking species through the process of lipid peroxidation. A major product of lipid peroxidation is malondialdehyde (MDA) and is usually considered a major marker of oxidative stress. Endogenous proteins are targets for free radical attacks. Carbonyl formation as an oxidation product that damages protein [19], MDA has been estimated as a marker of cell and tissue injury [26].

The results under study confirm the protective role of the aqueous extract of *A. graveolens* against H_20_2 induced oxidative stress, In rats. they showed a significant decrease in the level of MDA, which was in agreement with the studies by the authors [27 ,28] The present results indicate a blocking of oxidative stress pathways, and an antioxidant effect consistent with previous studies, which found that "*A. graveolens* " extract contains high concentrations of phenolic compounds and flavonoids that reduce the level of total

peroxidation and the oxidative stress index. [29]. These effects are attributed to the flavonoids present in the antioxidant *A. graveolens* and various vitamins and minerals. [30].

According to the results of the current study, there was a significant decrease in the level of MDA in the group (D) treated with the mixture of *A. graveolens* and *E. sativa*, and these results may be related to the effect of the twomix extract and the results agreed with the results of the study [31]. The study provides evidence for the stimulating effect of plant extracts (mixture of *E. sativa, A. graveolens*) and indicates that this extract has an effect against oxidative stress. These effects may be related to the chemical composition of the plant. [31].

Effects of values of The Antioxidant Variables Within The Experimental Groups

Effects of Values of The Variables of Glutathione (GSH) Within Experimental Groups

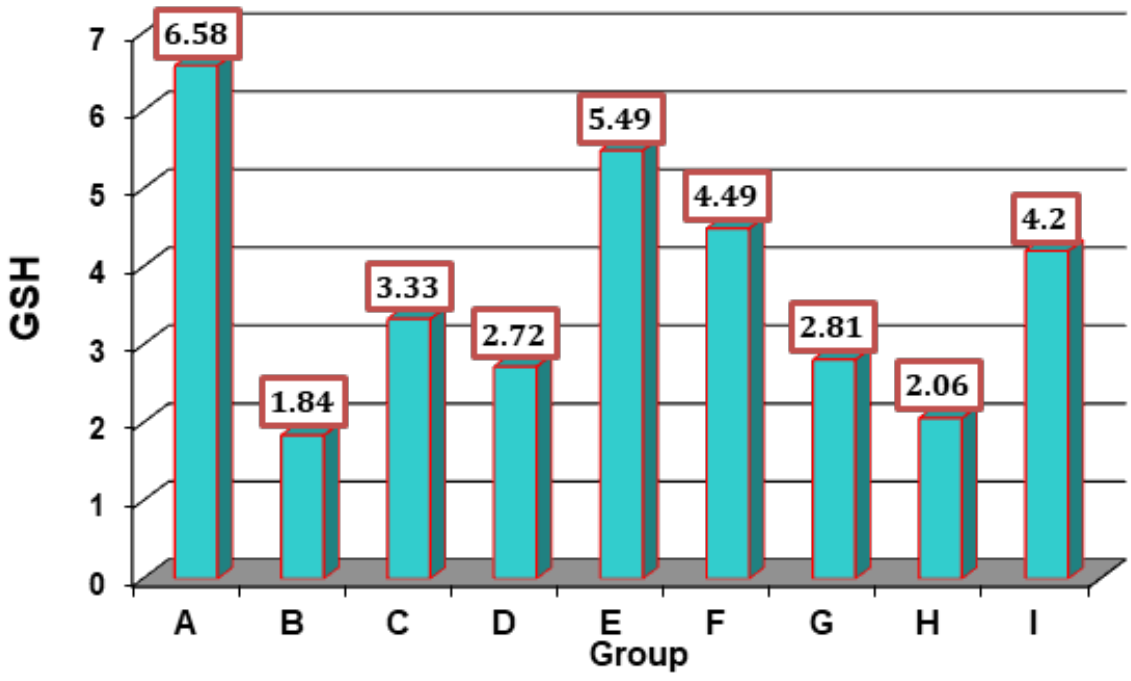
The results of the current study, through Fig (4-2), including the values of the antioxidant variable under study (GSH), showed a highly significant decrease ((P < 0.01)) in the values of the studied hematological variables of experimental animals in the negative control group (B) in the variable (GSH). Treatment with the compound (PHZ) compared to the positive control group (A), while the results of the current study showed the studied antioxidant variable (GSH) within the experimental anemic group (C) and treated with aqueous extract of *"A. graveolens*" (dose concentration 150 mg/ kg) showed a high level of morale ((P < 0.01)) compared with the negative control group (B).

The results of the study for group (E) treated with aqueous extract of "*A. graveolens*" (dose concentration '150 mg/ kg') and aqueous extract of *E. sativa* plant (dose concentration '250 mg/ kg') indicated that the values of the variable (GSH) showed a highly significant increase ((P < 0.01)). When compared with the negative control group (B), while the results of the study indicated for the group (F) treated with aqueous extract of the plant." *A. graveolens*" (dose concentration 150 mg/ kg) and the aqueous extract of "*E. sativa* "(dose concentration 250 mg/ kg) and iron (dose concentration 4 mg /kg) that the values of the vari-

able (GSH) showed a highly significant increase ((P<0.01)) when compared with the negative group (B). It was noted in group (G) that the results of the study and treatment with (PHZ) with the aqueous extract of *A. graveolens* plant. (Dose concentration 150 mg /kg) that the values of the variable (GSH) showed a highly significant ((P < 0.01)) when compared with Negative group (B)

The results also showed that the highest value of the variable (Glutathione (GSH) was for group (A), while the lowest value was for group (B).

The results of the current study showed in Fig (4-2) that the average mean concentration of the values of the variable (GSH) for the study groups is as follows: group (C) (3.33 ±0.19), group (D) (5.49 ±0.16), group (E) (4.49 ±0.19), and group (F) (2.81 ±0.08), while the average concentration of the positive control group (A) and the negative control group (B) (6.58 ±0.23) (1.84) ±0.08) respectively



FIGURE(4-2) Compare between difference groups in GSH

The results of this study, which showed that anemia causes a decrease in the antioxidant defense system, enzymes (SOD, GPX) and non-enzymes (GSH) in the blood serum, as well as an increase in blood antioxidants (MDA). The results of our study support a role of oxidative stress/antioxidant status in precipitation in anemia. Next, the antioxidant defense system including enzymatic and non-enzymatic and oxidants in the blood should be considered as important biochemical indicators during the assessment and/or diagnosis of anemia. Additionally, iron-rich foods such as "*A. graveolens"* should be advised. Provides antioxidant effects of *A. graveolens* are iridoids and phenolic acids *A. graveolens* is believed to prevent anemia [32]. Flavonoids prevent damage to cellular components due to chemical reactions involving (free radicals). Some of the mechanisms are ROS inactivation and stimulation Antioxidant production Antioxidant properties are also shown by phenolic acids that have an effect on inhibiting ROS, formation. [33].

Results of the study showed that "*A. graveolens"* is a good source of "antioxidants" for its phenolic richness [34] The results of the study in terms of levels of (GSH) and *A. graveolens* extract group agreed with the results of previous studies of researchers [35 ,36] as it increased compared with the negative control group (B) "*A. graveolens*" affects biochemical factors such as glutathione, xanthine oxidase, and glutathione peroxidase, in hemolytic anemia [36] Extracts of the root and leaves of *A. graveolens* act as antioxidants because they act as a radical scavenger (OH) and(DPPH) along with a lipid peroxidation inhibitor. [37].

Effects of Values of The Variables of Superoxide Dismutase (SOD) Within Experimental Groups:

The results of the current study, through Fig (4-3), which included the values of the antioxidant variable under study, which included (SOD), indicated that there were no significant differences in the values of the studied hematological variable of the experimental animals in the negative control group (B) treated with the compound (PHZ). Compared to the positive control group (A), while the results of the current study for the variable (SOD) within the experimental anemia group (C) and treatment with the aqueous ex-

tract of "*A. graveolens"* (dose concentration '150 mg/ kg') showed that there were no significant differences when compared to the group Negative (B).

The results of the study for group (E) treated with aqueous extract of *"A. graveolens"* (dose concentration 150 mg /kg) and aqueous extract of *"E. sativa* "(dose concentration '250 mg/ kg') for variable (SOD) values indicated that there were no significant differences when compared with the negative group (B), the results of the study for group (F) treated with aqueous extract of *"A. graveolens*" (dose concentration '150 mg/ kg') and aqueous extract of "*E. sativa*" (dose concentration '250 mg/ kg') and iron (dose concentration '4 mg/ kg') indicated that there were no significant differences. When compared to the group (B). It was also noted in group (G) that the results of the study and treatment with (PHZ) with aqueous extract of "*A. graveolens*" (dose concentration '150 mg/ kg'). The values of the variable (SOD) showed no significant differences when compared to the negative control group (B).

The results; also showed that the highest value of the Superoxide Dismutase (SOD) variant was for group (I) and the lowest value we observe in group (B).

The results of the current study showed in Fig (4-3) that the average mean concentration of the values of the variable (SOD) for the study groups as follows: group (C) (1042.23 ±224.8), group (D) (873.93 ±96.5), group (E) (929.26 ±182.6), and group (F) (716.08 ±40.29), while the average concentration of the positive control group (A) and the negative control group (B) reached (1138.38 ±265.0) (659.56 ±38.9), respectively.

The results of the study showed that there were no statistically significant differences in the protective role of *Apium graveolens* for the level of (SOD). The results under study differed with the results of the researcher [35].

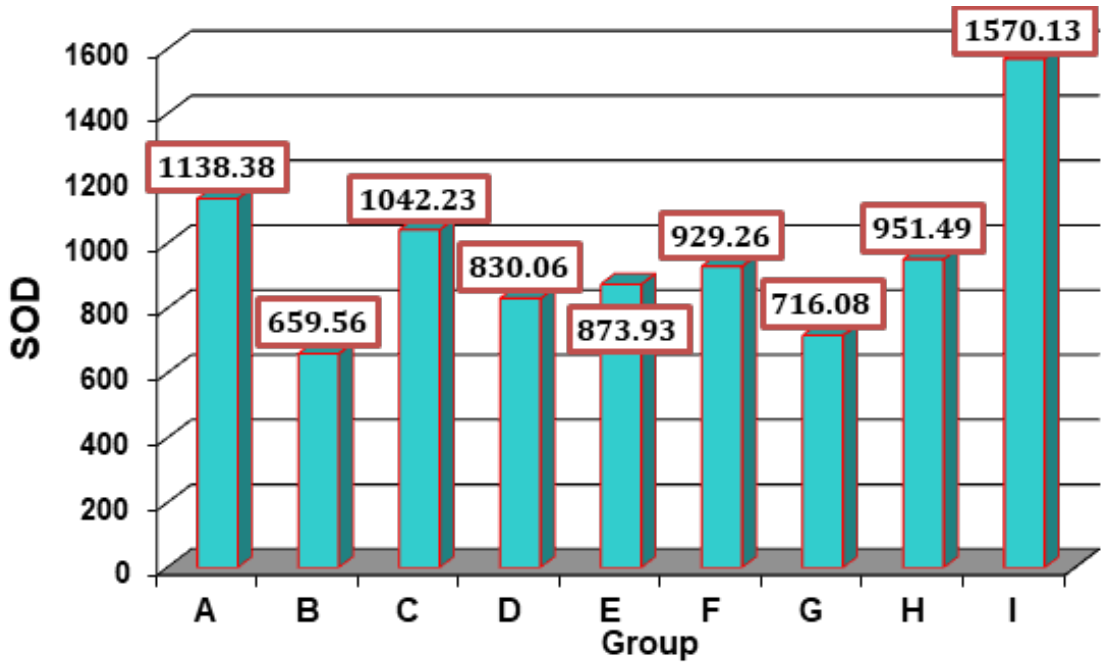


FIGURE (4-3) Compare between difference groups in SOD

Effects of Values of The Variables of Glutathione Peroxidase (GPX) Within Experimental Groups:

The results of the current study, through Fig (4-4), which included the values of the antioxidant variable under study, which included (GPX) showed a highly significant decrease ((P < 0.01)) in the values of the studied hematological variables of the experimental animals in the negative control group (B) in the variable (GPX) treatment with the compound (PHZ) compared to the positive control group (A), while the results of (GPX) values within the experimental anemia group (C) and the treatment with the aqueous extract of "*A. graveolens"* (dose concentration '150 mg/ kg') showed that there were no Significant differences when compared to the group (B).k2

The results; of the study for group (E) treated with aqueous extract of *"A. graveolens"* (dose concentration 150 mg/ kg) and aqueous extract of *"E. sativa*' (dose concentration 250 mg/ kg) indicated that the values of the variable GPX showed a highly significant ((P < 0.01)) when compared. With the negative control group (B), while the results

of the study indicated for the group (F) treated with aqueous extract of *A. graveolens* (dose concentration 150 mg/ kg) and aqueous extract of *E. sativa* plant (dose concentration 250 mg/ kg) and iron (dose concentration 4 mg/kg) that the values of the variable (GPX) showed a highly significant increase ((P < 0.01)) when compared with the negative control group (B) and it was noted in group (G) that the results of the study in it and the treatment with (PHZ) with aqueous extract of *A. graveolens* (dose concentration 150 mg/ kg) that the values of the variable (GPX) showed a highly significant increase ((P < 0.01)) when compared to the negative control group (B).

The results also showed that the highest value of the variable (Glutathione Peroxidase (GPX) was for group (I) and the lowest value we observe in group (B).

The results of the current study showed in Fig (4-4) that the average mean concentration of the values of the variable (GPX) for the study groups as follows: "group (C)" (1.07 ± 0.06), "group (D)" (1.40 ± 0.10), group (E) (1.35 ± 0.08), group (F) (2.29 ±0.17), and group, while the average concentration for the positive control group (A) and the negative control group (B) was (1.44 ±0.13) (0.678 ±0.22), respectively.

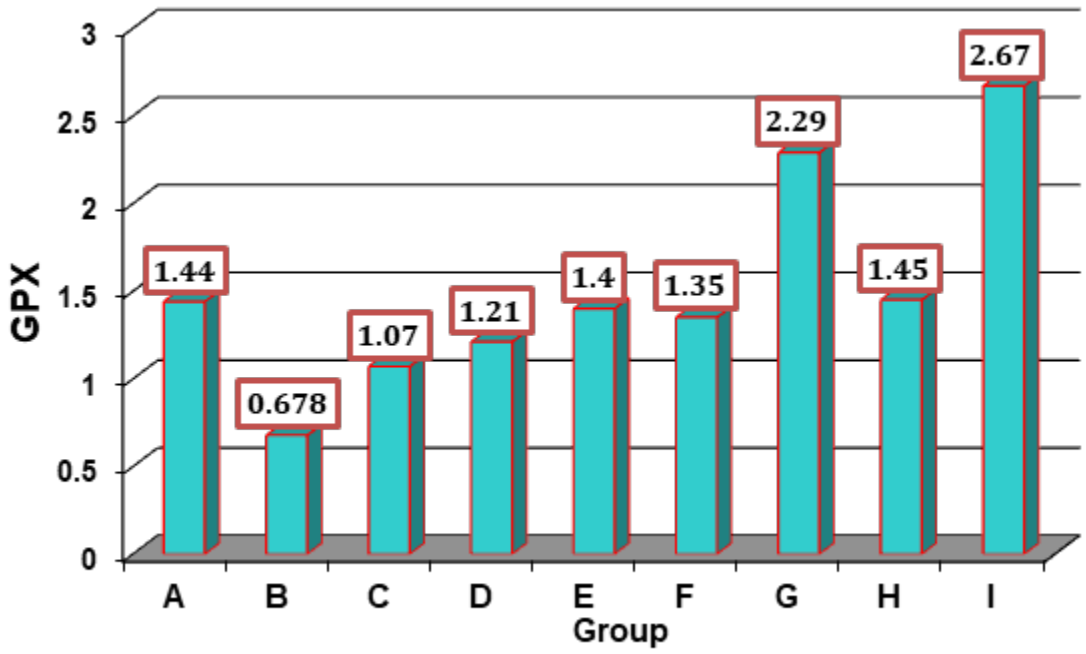


FIGURE (4-4) Compare between difference groups in GPX

"Flavonoids" possess antioxidant power by efficiently scavenging various free radicals. Flavonoids act by modulating antioxidants. [38]." Flavonoids" prevent damage to cellular contents due to chemical reactions that involve free radicals and include some mechanisms such as inactivation of ROS as well as stimulating the production of antioxidants. The antioxidant properties also appear through phenolic acids, which usually have an effect on preventing the formation of ROS. It is also related to the inhibitory effects of (pro-inflammatory) cytokines on the formation of red blood cells, which is a cause of "anemia". [33].

The results showed that the highest protective effect of antioxidants in *A. graveolens* was at the level of (GPX), which was in agreement with the study of the researcher [35]*" A. graveolens*" extract is a good cleaning tool for OH and DPPH, free radicals. [35].

CONCLUSION

The results of the study under study indicate that the plant *A. graveolens* contains strong antioxidant properties to remove free radicals and has medicinal changes in the treatment of anemia, and gave results of the value of the plant's composition and its medicinal properties provide a natural source as an antioxidant.

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