

Effect of the efficacy of cabbage extract on the level of certain antioxidants in white male rats exposed to carbon tetrachloride

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Abstract

The current study aims to find out the protective effect of the aqueous extract of the leaves of the cabbage plant in both green and red types in reducing oxidative stress induced by carbon tetrachloride and activating antioxidants in male white rats.

50 Swiss male rats were used, and distributed into 10 equal groups and placed in plastic cages containing each cage of 5 rats that underwent appropriate laboratory conditions, and the groups were divided as follows:

- ☐ Group I: Olive oil dose was given by tube feeding in the amount of 0.3 ml per rat,
- ☐ Group II: CCl₄ was given in the amount of 0.2 ml after mixing it with equal amounts of olive oil by peritoneal injection, meaning (we take 1 ml of olive oil and mix it with 1 ml of CCl₄) and this becomes ready for peritoneal injection,
- ☐ Group III: CCC₄ was injected by 2 0.ml by peritoneal injection for four weeks, after which the aqueous extract of green cabbage was given 1 ml,
- ☐ Group 4: CCl₄ was injected in .2 0 ml by peritoneal injection for four weeks and then given the aqueous extract of red cabbage in the amount of 1 ml,
- ☐ Group V: CCl₄ was injected by 0.2 ml by peritoneal injection for four weeks, after which the aqueous extract of green and red cabbage was given 1 ml
- ☐ . Group F: Salmarin was given 1 mg per rat.
- ☐ Group G: Aqueous extract of green cabbage was given in the amount of 1 ml.
- ☐ Group H: Aqueous extract was given to red cabbage in the amount of 1 ml,
- ☐ Group IX: Aqueous extract was given to green and red cabbage in the amount of 1 ml,
- ☐ Group X: Control group was given 3 ml distilled water and by gastric feeding tube with the provision of the diet.

Then blood samples were drawn and serum was separated by common methods and catechin tests were conducted on it, and the results of the treated groups were as follows:

- 1) The results showed a significant increase in the concentration of (MDA) Mallondialdehyde in the groups injected with carbon tetrachloride.
- 2) The results showed a significant increase in the concentrations of Catalase (CaT), Glutathion Peroxidase , SOD)) Superoxide Dismutse (GPx) In carbon-free aggregates
- 3) A significant decrease in the concentration of Mallondialdehyde was observed in the groups dosed with green and red cabbage and the group of salmarin herb (free of carbon tetrachloride).

Keywords: *Cabbage, Malondialdehyde, Superoxide dismutase, Catalase, Glutathione peroxidase.*

INTRODUCTION

Cabbage is considered one of the most important antioxidants that reduce damage caused by free radicals, because it is a rich source of dietary fiber necessary for a healthy diet, as it helps reduce the level of cholesterol and maintains regular blood sugar levels, as it is rich in vitamins necessary for many body functions, including vitamin C, K.

Cabbage is also rich in sterols, which are cholesterol-like plant compounds that help lower LDL cholesterol by reducing its absorption in the digestive tract (1).

There are defense mechanisms against the action of these radicals, which are called antioxidants, which include free radical scavengers, including antioxidant enzymes such as catalase (CAT), superoxid dismutase (SOD), and the second section is Chain breaking antioxidants such as vitamins (A, B, C, E) and phenol compounds and glutathione peroxidase (GPX), which have an important and indispensable role in the complete defense strategy of antioxidants (2).

The plant kingdom is the actual important source of most of the medicines that are waiting to be discovered, as the therapeutic use of herbal medicines has gained very great importance, and the reason for this is due to the side effects and high toxicity of manufactured chemical drugs, which led to the rationalization of their use in recent times (3)

There are many plant sources in their types and content of antioxidants, there are many plants that have been used to treat oxidative stress resulting from the formation of free radicals within the body (4).

The importance of medicinal plants is evident in their diverse effects as antimicrobial, anti-inflammatory, analgesic, anti-inflammatory skin and nerve, anti-cholesterol and many other effects (5) (6).

Objectives of the study

The current study aimed to:

Evaluation of the efficiency of aqueous extracts of green and red cabbage plant as antioxidants in male white rats exposed to oxidative stress induced by carbon tetrachloride by measuring the level of glutathione peroxidase Gpx, mallow dialdehyde MDA in serum, superoxide dysmutase enzymes SOD and catalase, CAT.

Articles and working methods

Estimate Dual-Aldehyde Malone
Concentration in Blood Serum

Principle of interaction

Thiobarbituric acid TBA modified reaction method used by researchers (7) to measure MDA. It is one of the final outputs of the lipid peroxidation process, and its level is an indicator of this process. Measurement depends on the interaction between lipid

peroxides, particularly aldehyde-binary financiers, with TBA in a pH-based medium.

Super Oxide dismutase SOD

Basic Principle.

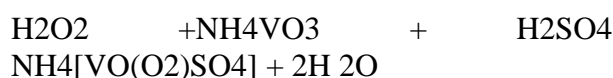
The effectiveness of superoxide enzyme was estimated using: Modified method photochemical Nitroblue Tetrazolum (NBT), this method involved the use of sodium cyanide as a peroxidase inhibitor, and this method is based on the assessment of the effectiveness of SOD photosynthesis in an indirect alteration of Ozoformin From irradiation of the blood serum. (The decrease in formazine optical density is an indication of the increased effectiveness of the enzyme (SOD) (8).

Estimation of the effectiveness of catalase enzyme

Principle of interaction:

The principle of this method involves the reaction of ammonium metaphenadite with hydrogen peroxide under acidic conditions, where vanadium (V) is reduced to (III). Hydrogen peroxide is a strong oxidizer that leads to the formation of the red-orange pyroxophanadium complex, which is absorbed at 452 nm (9).

As the following equation



Determination of the Effectiveness of Glutathione Peroxidase

Principle of interaction:

The activity of glutathione peroxidase was estimated using the (10) method.

This method included the use of solutions and then incubation of the mixture at a temperature of (37 °C) for 3 to 4 minutes, and the reaction began by adding (0.1 cm 3) of serum, and the first absorbency of the addition time was

recorded directly at a wavelength of 510 nm, and then the second absorbency was recorded after 5 minutes.

Solutions used:

□ Solution (0.0017 molar) hydrogen peroxide H_2O_2

□ Solution (0.0025 molar) 4-aminocente pyrene and (0.17 molar) phenol

Statistical analysis

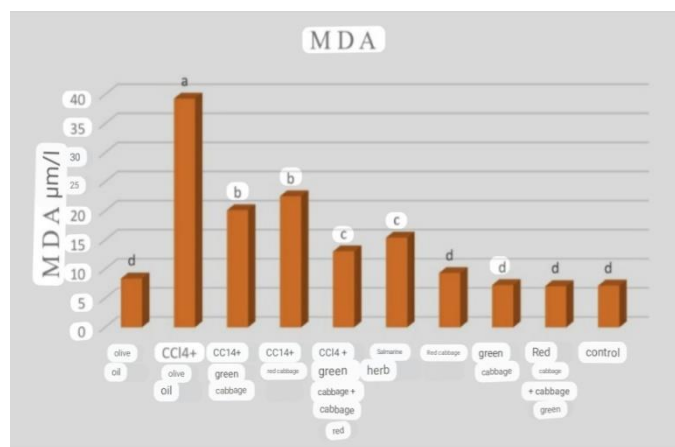
The results were analyzed statistically by applying the electronic statistical program (Minitab, 2006) and using the analysis of variance test (anova) and the arithmetic averages were compared using Duncun multiple range with a significant level of

($P \leq 0.01$, $P \leq 0.05$)

Results and Discussion

Protective effect of aqueous extract of cabbage plant in oxidative balance - antioxidants (MDA, SOD, CAT, GPX) in healthy male rats exposed to oxidative stress. Concentration of MDA Dialdehyde Malon in Blood Serum of Male White Rat

Figure (1) shows the effect of different coefficients of cabbage extract on MDA concentration in study groups



□ Number of rats (5) in each group

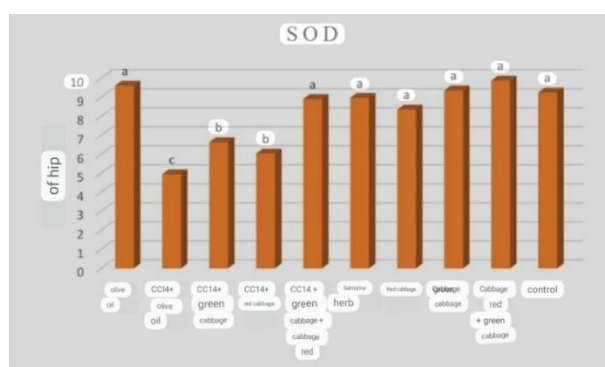
□ The values are expressed in arithmetic mean \pm standard deviation.

□ Different letters mean a significant difference at the level of significance

($P < 0.01$, $P < 0.05$)

Concentration of Super Oxide Dismutase SOD Enzyme in the Blood of Male White Rats

Figure (2) shows the effect of different coefficients of cabbage extract on SOD concentration in study groups



□ Number of rats (5) in each group

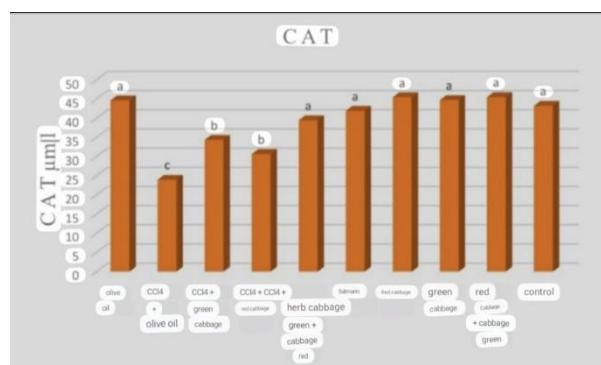
□ The values are expressed in arithmetic mean \pm standard deviation.

□ Different letters mean a significant difference at the level of significance

($P \leq 0.01$, $P \leq 0.05$)

Concentration of Cat Enzyme NT Blood Serum of Mal white Rats

Figure (3) shows the effect of different coefficients of cabbage extract on CAT concentration in study groups



□ Number of rats (5) in each group

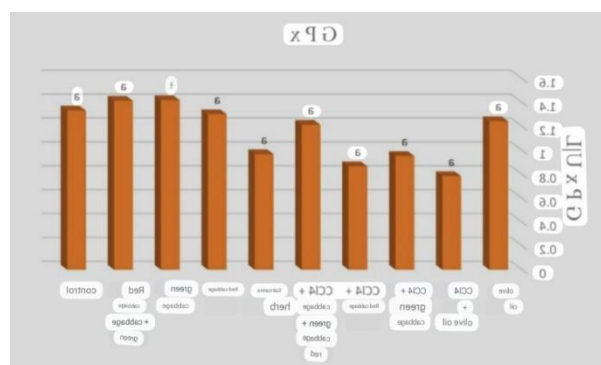
□ Values expressed in arithmetic mean \pm standard deviation

□ Different letters mean a significant difference at the level of significance

($P \leq 0.01$, $P \leq 0.05$)

Concentration of Clotathion peroxides enzyme Gpx in white rat blood serum

Figure (4) shows the effect of different coefficients of cabbage extract on GPx concentration in study totals



□ Number of rats (5) in each group

□ The values are expressed in arithmetic mean \pm standard deviation.

□ Different letters mean a significant difference at the level of significance

($P \leq 0.01$, $P \leq 0.05$)

The results in Figure 1 showed a significant increase of ($0.01 \leq p$) in the level of MDA in the second group that was injected with carbon tetrachloride, reaching (6.44 ± 39.30) $\mu\text{m/l}$ compared to the control, and this is consistent with (12), (13) and (14) which indicated an increase in lipid peroxide levels (15) This is probably because CCl_4 works by inhibiting metabolic pathways through cytochrome and in the presence of oxygen to the formation of the active derivative $\text{CCl}_3\text{O}\cdot$, which attacks cell membranes and increases of the level of MDA which is the final product of lipid peroxidation and is a measure of free radical generation.

In addition, there is an increase in the formation of free radicals, especially trichloromethyl radicals, which are characterized by their high toxicity, which in turn attack fats and their compounds in the body, especially cell membranes, and work to damage and oxidize them, and this process is called lipid peroxidation, which forms a series of dangerous products, including MDA (16). He also indicated that the most important reasons for the high levels of MDA is a decrease in the level of HDL as a result of an inverse relationship between them, in addition to oxidative stress caused by chloride, which causes increased production of effective oxygen types, which in turn leads to the depletion of antioxidants, including glutathione and increased MDA (18), while it was observed in figures (2), (3), (4) a significant increase in ($p \leq 0.01$) in the levels of SOD, CaT, GPx in the groups free of tetrachloride. Carbon, including the sixth group injected with the herb salmarin U/L (2.50 ± 8.970), I (9.52 ± 41.94) μm , U/L (0.367 ± 0.968).

And the seventh group dosed with green cabbage U/L (1.929 ± 8.353), (1.968 ± 45.49) $\mu\text{m/l}$, (0.2325 ± 1.302) $\mu\text{m/l}$, and the eighth group dosed with red cabbage L (2.58 ± 9.360) U/L, (4.17 ± 44.74), (0.269 ± 1.420) $\mu\text{m/l}$,

and the ninth group dosed with mixed cabbage (1.412 ± 9.881) U/L, (7.20 ± 45.51) $\mu\text{m/l}$, (0.392 ± 1.415) $\mu\text{m/l}$, this result is consistent with the findings of the researcher (19) The reason for this is due to the plant's ability to provide protection for liver cells because they contain phenolic compounds and antioxidants with strong antioxidant effects, which analyze reactive oxygen receptors on cell membranes and thus work to remove free radicals and improve defense capacity, and thus carbon tetrachloride does not have the ability to damage cells (20), in addition to vitamin C, which suppresses oxidative stress and raises the effectiveness of antioxidants through Free radical resistance and stability, and this leads to maintaining the vitality of the cell organelles from the risk of oxidative stress and thus reduces MDA levels (21), while a significant decrease in MDA concentrations was observed in the carbon-free groups, which include the seventh group dosed with green cabbage $\mu\text{m/l}$ (2.76 ± 9.33).

The eighth group dosed with red cabbage (2.251 ± 7.25) $\mu\text{m/l}$, the ninth group dosed with mixed cabbage (red and green) $\mu\text{m/l}$ (1.296 ± 7.07), the sixth group dosed with salmarin herb $\mu\text{m/l}$ (15.41 ± 4.75).

These results are consistent with the findings of the researchers (19) (22) and the reason is probably due to the ability of the cabbage plant and salmarin to provide protection for liver cells because they contain vitamin A-C-D, which in turn increases the ability to get rid of free radicals as active substances such as Flavonoids, phenols and carotenoids such as beta-carotene to resist lipid peroxidation and reduce levels of free radicals and reduce MDA levels, reduce the effectiveness of Peroxisomes and increase the effectiveness of the enzyme Catalase (mighty (23), and work as a protective agent against oxidative stress These extracts reduced the oxidative damage process (24), while the treatment of male rats with carbon tetrachloride resulted in

significant decreases ($p \leq 0.01$) in SOD and CAT levels, which agreed with (25). Where studies have indicated that an imbalance between the internal levels of oxidative generators and antioxidants will produce free radicals excessively leading to their accumulation inside the cell, and in order to protect against the toxic action of these radicals, the cells develop enzymatic and non-enzymatic defense mechanisms and thus their levels will decrease, and the reason for this is that CCl₄ has the ability to break down biomolecules and cause oxidative damage and produce free radicals and thus cause lipid peroxidation, which in turn causes a decrease in the overall Enzymatic antioxidants, including catalase (CAT, GPx, and SOD) (26) These results were also consistent with the findings (13) that observed an increase in MDA and a decrease in SOD in male rabbits with oxidative stress induced by carbon tetrachloride.

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