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The role of Coriandrum sativum in treatment of kidney lesions that induced by Toxoplasma gondii in male rats

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Abstract

The purpose of this study was to demonstrate how an anti-parasitic drug can be obtained from an aqueous extract that was taken from the leaves of Coriandrum sativum and used to test the viability of Toxoplasma gondii. In this study, a total of 20 male rats were used, divided into the following four groups (with each group containing four rats): The normal saline was administered to the rat in the oral route. T. gondii tissue cysts were administered intraperitoneally into a rat in a volume of one milliliter containing one hundred tissue cysts. The extract of Coraindrium sativum was given to the rat every day via oral administration at a dose of 250 mg/kg body weight. A rat was given an intraperitoneal injection of 1 milliliter of T. gondii tissue cysts and then given an extract of leaves at a dosage of 250 milligrams per kilogram of body weight each day for a period of 30 days. When compared with control rats, the study's findings showed a substantial ($P < 0.05$) increase in MDA along with a decrease in levels of GSH and catalase in rats that were given oral administration of 50u/ml of cell wall extract. When compared with control rats, the treated rats' data showed changes in oxidative status that were not statistically significant ($P > 0.05$). Histological examination of kidney slides revealed thickening of the wall of blood vessels, bleeding, and fibrosis in the kidney of a rat that had been injected intraperitoneally with one milliliter of T. gondii tissue cysts, each of which contained one hundred tissue cysts. Following therapy with an extract of leaves, the kidney returned to a state that was closer to normal. The researchers came to the conclusion that Coriandrum sativum possesses antioxidant properties and acts as an anti-parasite agent. Therefore, and on the basis of the findings of the current investigation, it was determined that the aqueous extract of Coriandrum sativum exhibits the ability of a high antioxidant to eliminate the influence of free radicals, as well as a high property as an antiparasitic. This was the conclusion reached as a consequence of the findings of the study.

Keywords: Coriandrum sativum; Toxoplasma gondii; oxidative stress; kidney.

Introduction

The define of toxoplasmosis disease is *Toxoplasma gondii* infection, a member of the family of eukaryotes known as Apicomplexa. Toxoplasmosis is an infection that can affect humans as well as other animals with a warm body temperature. This protozoan parasite poses a significant threat to both public health and financial security [1]. Because they can cause a wide range of clinical outcomes, including abortion for pregnant women, inflammation of the retina and choroid, neurological disorder (hydrocephalus), mental retardation or intellectual disability, and even fatal death, or who are receiving immunosuppressive therapy, T. gondii infections continue to be a major public health concern [2,3]. The first two stages of development in a sexual period are the rapidly replicate tachyzoites and the transport into the slowly replicate stage, that lead to the cell to rupture and produce organisms. (4,5). The parasite is able to maintain its overall size and shape even as the host's immune system strengthens, but it undergoes a metamorphosis into the bradyzoite and reproductive more slowly within tissue cysts, so establishing a protracted infection [6]. These small tissue cysts, which represent the dormant stage of the parasite within the host, are most commonly seen in the brain and muscle. The presence of viable cysts within muscle can be a substantial source of infection in humans. Tachyzoite form can be located in fluid called ascetic fluid or in impression smears of lung, and in tissue sections of the liver and other afflicted organs, in animals that have been exposed to acute infection [7]. Since the beginning of time, the life of humans and plants have been inextricably intertwined. Since ancient times, humans have been able to discriminate between plants that are edible and plants that are ideal for use as fuel for fire, all while avoiding species that could potentially injure them. The scientific name for the coriander

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plant is "*C. sativum*" and it is a member of the Umbelliferae family of plants. Linalool, camphor, and limonene are some of the essential volatile oils that can be found in this substance. In addition to flavonoids and phenolic, it also has several other significant compounds such as coumarines, tannins, and glycosides [8]. In addition to this, coriander is packed with a wide variety of essential nutrients. Particularly its leaves are prized for their high levels of beneficial nutrients such as plant fibers, iron, manganese, and magnesium. Because coriander is one of the medical plants that produces volatile oils and fatty acids, it has been the subject of extensive and ongoing research in both biotechnology and tissue culture. This is because of the significance of coriander as a medical herbal. When compared to the use of traditional agriculture in the manufacture of certain essential compounds for metabolism, it has been demonstrated that the creation of medical substances by means of tissue culturing is a superior option [9]. Coriandrum sativum extracts have recently sparked interest as potential sources of natural products, and the plant itself has been investigated for the possibility of serving as an alternative treatment for infectious diseases while also providing safety from the potentially harmful effects of oxidants. In addition to this, it possesses a wide variety of bioactive chemical components, including essential oils, phenols, terpenes, and linalool alcohol. Therefore, in this study, an aqueous extract isolated from the leaves of Coriandrum sativum was used as an anti-parasite agent to investigate the viability of Toxoplasma gondii. Since the essential oils of Coriandrum sativum are used as antibacterial agents [10,11] especially against multi-drug resistant bacteria which considered as a global problem[12-18], this extract was used as an anti-parasite agent in this study.

Materials and methods

Toxoplasma gondii tissue cysts

The tissue cysts of T. gondii were isolated from the brain tissue of infected rabbit. Following the grinding of the brain tissue, the mixture was then filtered through gauze after being suspended in phosphate buffer saline at a pH of 7.2. In accordance with the methodology described in [19], one milliliter containing one hundred tissue cysts was administered intraperitoneally into Swiss mice. Every day, mice were examined for any indication of a fever.

Aqueous extraction of *Coraindrium sativum*

After being cleansed with distilled water, the leaves of *C. sativum* was procured from neighborhood markets in Baghdad, cut up into small pieces, and ground into a fine paste using a pestle. The aqueous extract of coriander leaves was made by first mixing a limited weight of the paste with 10 ml of distilled water, and then filtering the mixture through a cleaning cloth to produce an extract with a dose level of 125 and 250 mg/kg.b.w. respectively. Immediate administration of a fresh extract was performed on the mice [20,21].

Animal model

20 male rats were used for this study in total (wt 150-190 gm with age 3-5 month). The rats were fed their regular food up until the beginning of the trial.

Experimental design

In this study, a total of 20 male rats were used, with four rats assigned to each of the following groups:

A. The normal saline was given to the rat in the oral route.

B. T. gondii tissue cysts were administered intraperitoneally into a rat in a volume of one milliliter containing one hundred tissue cysts.

C. The extract of Coraindrium sativum was given to the rat every day via orally at a dose of 250 mg/kg body weight.

D. A rat was treated with leaves extract at a dosage of 250 milligrams per kilogram of body weight on a daily basis for a period of thirty days after receiving an intraperitoneal injection of one milliliter of T. gondii tissue cysts.

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Measurements

According to [22], a spectrophotometer was utilized in order to perform the MDA estimation. Using the procedure described in [23], a spectrophotometer was used to conduct an analysis of GSH. Catalase levels were determined by using the protocol provided in the Biovision kits.

Histological study

Quick dissections were performed on the fresh hearts of all of the rats, after which they were fixed with 10% formalin and dehydrated with escalating concentrations of ethanol. After being washed in two different variations of xylene, tissue samples were dehydrated before being impregnated in two different variations of liquid paraffin wax, embedded, and blocked out. Hematoxylin and eosin were used to stain tissue slices that were five micrometers thick [24].

Statistical analysis

The Minitab program was used to perform the analysis on the data that was collected for this work. Utilizing ANOVA, a statistical comparison was carried out to determine whether or not there was a difference between the average values of the various groups.

Results & Discussion

Oxidative stress in liver extract

Rats in the second group have significantly higher levels of MDA (2.04 ±0.37), GSH (0.294 0.041), and catalase (0.91 0.09) compared to control rats (1.43 ±0.14; 0.449 ±0.043 and 1.29 ±0.28,). As shown in figure, the third and fourth groups for catalase (1.56 ±0.24; 1.29 ±0.09), MDA (1.33 ±0.16; 1.73 ±0.27), GSH (0.478 ±0.043; 0.412 ±0.032), and GSH show no significant differences (P 0.05)

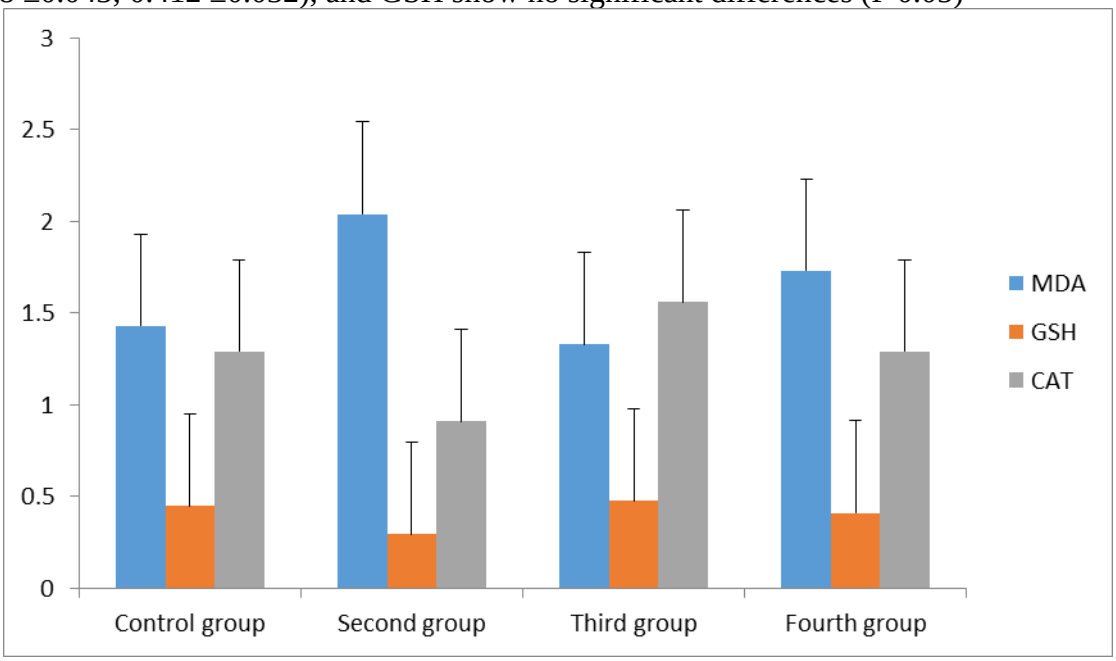

Figure 1 shows the concentrations of MDA, GSH, and catalase in the groups' kidney extracts.

Malondialdehyde, often known as MDA, is the lipid peroxide that is most prevalent in cells and tissues, and it serves as an indicator of oxidative stress [25]. Because of this, measures of MDA are commonly employed as an indication of lipid peroxidation. Furthermore, in both human and experimental systems, higher levels of oxidative stress have been linked to a wide range of chronic illnesses [26]. A considerable increase in MDA level was generated by aflatoxin, which in this case was olsa, and this level was made worse by the treatment of mice with Toxoplasma tissue cysts. Toxoplasma tissue cysts and AF may have additive effects that increase the production of free radicals, that may then overwhelm defenses of cell and cause oxidative stress [27]. Cysts are abnormal structures found in the tissues that are caused by the parasite Toxoplasma. It is critical to be aware that, during a toxoplasmosis infection, the combined damaging effects of AF and *T. gondii* on

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glutathione formation may disrupt glutathione's protective effect on ROS [28]. This study found that toxoplasmosis led to the generation of free radicals, which is consistent with the findings of [29]. A reduction in the amount of glutathione superoxide dismutase (GSH) activity in patients who test positive for Toxoplasma indicates a weakened response to oxidative stressors. The elevated levels of MDA found in patients infected with toxoplasmosis may indicate a diminished activity of defense system that protects tissues from harm caused by free radicals [30]. about the plant extract and its function in the current study, our results are consistent with those of [31], which reported that *Coriandrum sativum* seed extract protected male mice's liver and kidney versus lead nitrate-induced oxidative damage and tissue destruction. These effects were observed in the current research. This similarity in results may be attributable, in part, to a component of the plant that was investigated in the experiment.

Kidney tissue

Histological analysis reveals the glomerulus and tubules in the control group to be in their normal, unaltered structures. In the portion of the kidney belonging to the second group, which was infected, there was damage to the glomerulus as well as endothelial desquamation of convolute tubules, which was accompanied by bleeding and fibrosis. Following therapy, the semi-normal structures of the kidney tissue may be seen in the third and fourth sets of kidney sections. The infection with the Toxoplasma parasite caused a variety of damages in the kidneys of mice. Treatment with an extract of Coriandrum sativum improved the kidney tissues, which in turn implies that the plant is efficient as both an antiparasitic and an antioxidant. Coriander leaves contain a significant amount of flavonoids [32] and a substantial amount of polyphenols [33]. Additionally, other molecules such as linalool and linoleic acid can be found in the leaves [34]. This may be one of the reasons why the plant extract plays such an important role.

Table (1): the kidney lesions in all studied group

Lesions Groups	Degeneration	Glomerulus damage	Tubules damage	Thinking wall	Inflammatory cells	necrosis
Control	-	-	-	-	-	-
Infected	+++	++	++	+	++	+
Extract	-	-	-	-	-	-
Infected and treated	+	Trace	Trace	-	-	Trace

Conclusions

Therefore, and on the basis of the findings of the current research, it was determined that the aqueous extract of C. sativum exhibits the ability of a high antioxidant to eliminate the influence of free radicals, as well as a high property as an antiparasitic. This conclusion was reached as a result of the findings of the study.

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