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Research Article

The Potential Protective Influence of Argan (*Argania spinosa* L.) Oil on Thioacetamide-intoxicated Male Rats

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Abstract

In the study, we assessed that how Aragn oil affected male rats who had been exposed to thioacetamide (TAA). The 40 rats used in the study were categorized randomly into four groups. Group I was used as a control group. TAA was administered twice weekly to rats in Group II via intraperitoneal injection. Group III rats were given 700 mg/kg body weight argan oil orally, followed by the same amount of TAA as group two rats. Group IV rats received the same amount of argan oil as Group 3. The liver, kidney function, and lipid profile were evaluated after six weeks of treatment. This study found that argan oil aided male rats in recovering from TAA-induced physiological changes.

Keywords: Argan oil; Thioacetamide; Liver enzymes; Lipid profile

Introduction

Thioacetamide (TAA) is one of many chemicals that cause liver centrilobular necrosis in animals, and it has been used in animal studies to induce liver necrosis. Chronic TAA intoxication in rodents via oral or intraperitoneal routes is thought to be a repeatable and reliable method for studying liver dysfunction [1,2]. TAA causes a variety of symptoms in animals when given for an extended period [3]. The liver, pancreas, kidneys, lungs, stomach, spleen, and thymus have all been shown to be affected by TAA [4,5]. TAA causes oxidative stress, which damages proteins, DNA, and lipids via free radicals [6,7]. The enzyme cytochrome P450 (CYP) 2E1 is responsible for TAA metabolism in the liver, and it has been linked to oxidative damage, inflammation, and cellular necrosis. Long-term TAA exposure exacerbates the problem, resulting in cirrhosis and hepatic fibrosis [8].

Herbalism has been around since the beginning of time, and some plants have medicinal properties. In recent years, traditional medicine treatment approaches that can be used as modern medications have gained popularity [9]. Because medicinal plants can be used to make a wide range of drugs, they are regarded as one of the most important sources of medication. Furthermore, because of their well-known natural healing process, long-lasting curative effects, an abundance of flavonoids and related compounds, and low side effects, certain medicinal plants deserve special attention [10-12]. Plant oils have been used for medicinal and protective purposes in the treatment of various illnesses since ancient times [13].

Argania spinosa is a member of the *Sapotaceae* family and grows at 1,500 meters height [14,15]. On the other hand, their biomass and fruit yields are radically different [16]. For the high genetic diversity, the Argan tree is famous and it is preserved in nature through an allogamic reproduction mode [17,18]. The most valuable part of the tree is the argan fruit, and argan oil is consumed raw in some parts of the world [19]. Regular consumption of argan oil has been shown to reduce the risk of cardiovascular disease, cancer, low-density lipoproteins, and blood cholesterol levels [20,21]. In conventional medicine, argan oil is used to treat con-

stipation, rheumatism, blood glucose control, and lung disorders. Argan oil is also used topically to treat dermatological conditions in adolescents, such as acne and dry skin [22].

Aim of the Study

The goal of this study was to see if argan oil could protect male rats exposed to thioacetamide.

Materials and Methods

Experimental animals

Animal House, of KAU, Jeddah provided forty male Wistar rats (120 - 150g) and also granted ethical approval. Following Al-Attar., *et al*. [5], procedure, the experimental animals were acclimatized to laboratory conditions.

Experimental design

We divided the experimental animals into four equal groups (n=10). The participants received agran oil orally for six weeks. The experimental design was as follows:

- **Group I:** Used as a control group.
- **Group II:** Rats were given 300 mg/kg body weight of TAA intraperitoneally twice a week.
- **Group III:** Rats received orally 700 mg/kg body weight argan oil and intraperitoneally the same dose of TAA as group II.
- **Group IV:** rats were given the same amount of argan oil orally as group III rats.

Samples collection

Blood samples were collected as described by Al-Attar., *et al* [5].

Measurement of blood glucose

The levels of blood glucose were measured following Petlevski *et al* [23].

Measurement of liver and kidney function test and lipid profile

The serum ALT, AST, ALP, GGT, urea, uric acid, creatinine, VLDL-c, LDL-c, and HDL-c levels were measured in TAA-intoxicated rats by an autoanalyzer using diagnostic (My BioSource, USA) Kits as instructed by the manufacturer.

Statistical analysis

The data is presented as a mean ± SD (n = 10) and a 95% level of significance was used to analyze the data. One-way analysis of variance (ANOVA) was used to determine the statistical significance of the difference between groups.

Results

Effect of argan oil on liver function enzymes

The variations in serum ALT, AST, ALP, and GGT are shown in figure 1-4. TAA-exposed rats (G2) had significantly higher serum ALT and ALP (U/L) levels than standard control rats ($p \leq 0.05$). The levels of AST and GGT in TAA-intoxicated rats (G2) and normal control rats (G1) were not significantly different. The serum ALT and AST levels in rats exposed to TAA (G3) and treated with argan oil decreased significantly ($p \leq 0.05$) as compared to rats treated with TAA alone (G2).

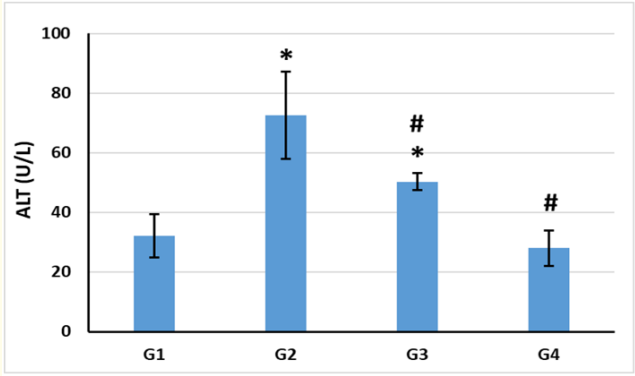

Figure 1: Assessment of the effect of argan oil on serum ALT (U/L) showed a significant difference ($p \leq 0.05$*) from the normal control group and TAA-induced rats.

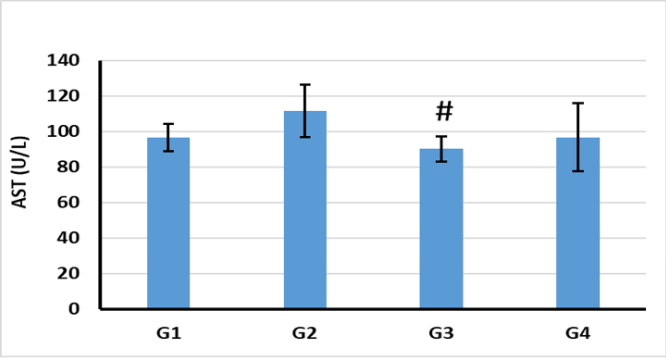

Figure 2: Effect of argan oil on serum AST (U/L) levels in normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil.

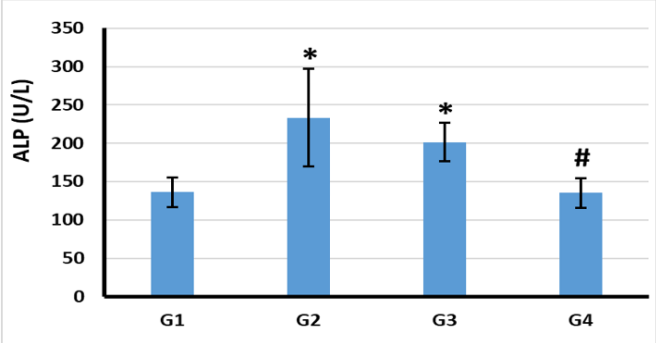

Figure 3: Effect of argan oil on serum ALP (U/L) levels in normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil.

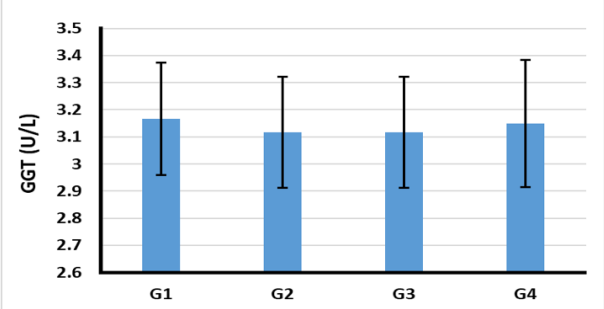

Figure 4: Effect of argan oil on serum GGT (U/L) levels in normal rats.

Effect of argan oil on serum blood urea, urea nitrogen (BUN) and creatinine

Among TAA-intoxicated rats (G2) and the standard control group, there was no statistically significant difference ($p \leq 0.05$). in serum BUN (mg/dl). Oral administration of argan oil resulted in a substantial increase ($p \leq 0.05$) in serum BUN levels as compared to TAA-intoxicated rats (G2). The effect of argan oil on uric acid levels in all experimental groups is depicted in figure 6. The levels of uric acid in TAA-intoxicated rats (G2) and normal control rats are not significantly different. Furthermore, treatment with argan oil resulted in a substantial ($p \leq 0.05$) decrease in uric acid levels in TAA-intoxicated rats (G3) as compared to TAA-intoxicated rats. When compared to the normal control group, creatinine levels in TAA-intoxicated rats (G2) increased significantly ($p \leq 0.05$) (Figure 1). Daily gavage of argan oil showed no substantial difference in serum creatinine levels as compared to TAA-intoxicated rats (G2) (Figure 7).

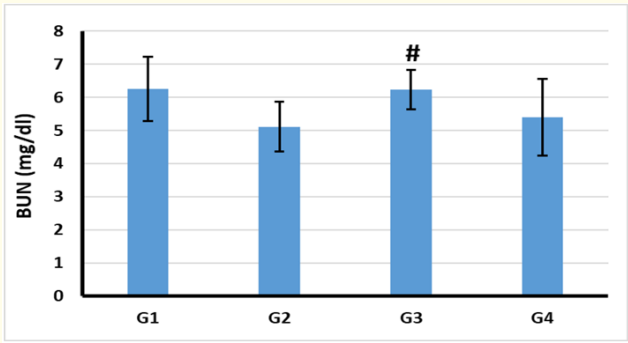

Figure 5: Effect of argan oil on serum BUN (mg/dl) levels in normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil.

Effect of argan oil on serum lipid profile

The serum cholesterol, triglyceride, LDL-c, VLDL-c, and HDL-c levels are shown in figure 8-12. When compared to the standard control group, TAA-intoxicated rats (G2) had non-significant variations in serum cholesterol, triglycerides, LDL-c, and VLD-c (G1). Rats exposed to TAA and then supplemented with argan oil (G3) had significantly lower HDL-c levels (p 0.05) than TAA-intoxicated

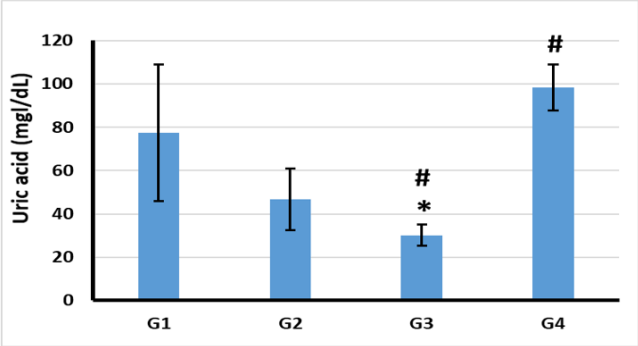

Figure 6: Effect of argan oil on serum uric acid (mg/dl) levels in normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil.

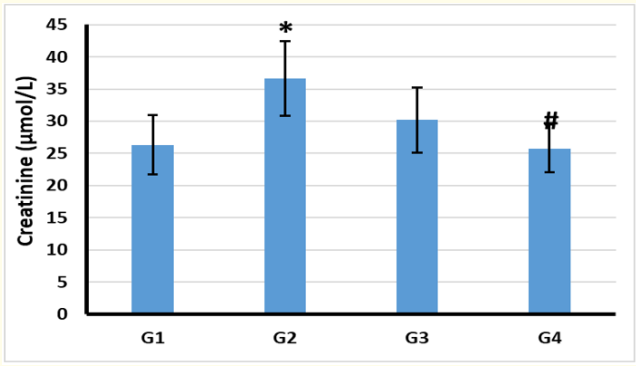

Figure 7: Effect of argan oil on serum creatinine (mg/dl) levels in normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil.

rats (G2). When compared to TAA-intoxicated rats, regular oral administration of argan oil to experimental animals (G8-G12) resulted in non-significant differences in cholesterol, triglyceride, LDL-c, VLDL-c and HDL-c levels.

Discussion

In the health systems of significant segments of the world's population, medicinal plants, natural products and nutrition continue to play important roles. Medicinal plants are used to treat a wide variety of diseases all over the world because they include a wide range of natural antioxidants. Antimicrobial, anti-cancer, anti-diabetic, anti-atherosclerosis, immune-modulatory, and even

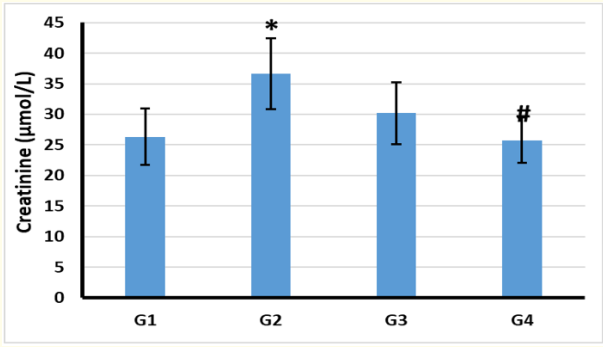

Figure 8: The effect of argan oil on serum cholesterol (mmol/L) levels.

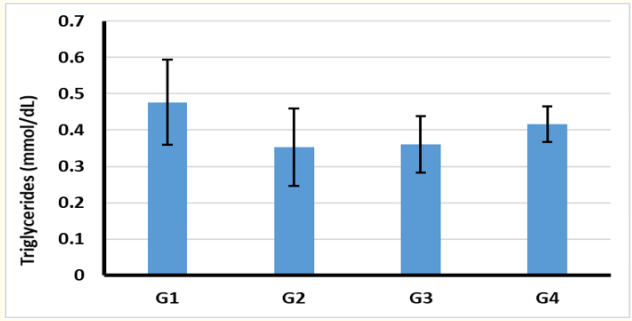

Figure 9: The effects of argan oil on serum triglyceride levels (mmol/L) in normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil.

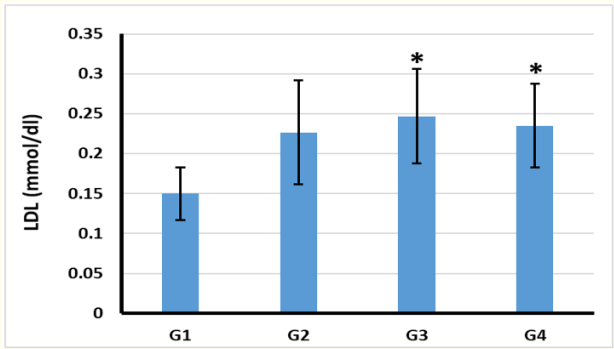

Figure 10: In normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil, the effect of argan oil on serum LDL (mmol/L) levels was studied.

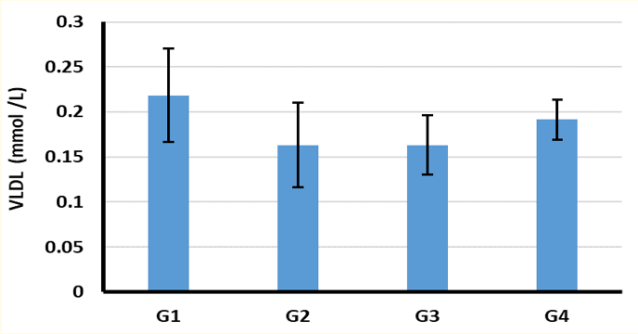

Figure 11: In normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil, the effect of argan oil on serum VLDL (mmol/L) levels was studied.

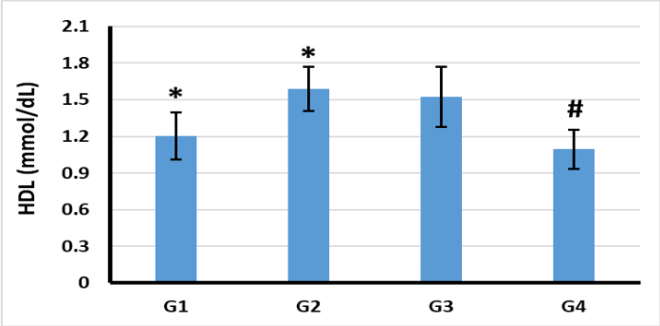

Figure 12: In normal rats, TAA-intoxicated rats, and TAA-intoxicated rats supplemented with argan oil, the effect of argan oil on serum HDL (mmol/L) levels was studied.

renoprotective or hepatoprotective properties have been found in medicinal plants [24,25]. The Argan tree is noted for its high genetic diversity, which is preserved in nature by a predominantly allogamic reproduction mode [17,18]. The Sahara Desert, the Anti-Atlas Mountains in southwestern Morocco, and the Mediterranean region are all home to this species. The Argan tree is noted for its high genetic diversity, which is preserved in nature by a predominantly allogamic reproduction mode [17,18,26]. The argan tree's chemical composition makes it suitable for cosmetics, food, and health products [26].

Hepatic metabolic enzymes such as ALT, AST, ALP, and GGT are important indicators of hepatic function and cell membrane integrity [27]. Hepatocellular damage is indicated by elevated ALT and AST levels, whereas cholestatic problems are indicated by elevated ALP and GGT levels [28]. Biochemical analysis of the lipid profile in rats exposed to TAA revealed a significant increase in serum ALT and ALP levels when compared to the normal control group. AST and GGT levels, on the other hand, remained unchanged. Furthermore, daily oral administration of argan oil to TAA-intoxicated groups reduced ALT and AST enzyme levels significantly. TAA-induced changes in liver enzyme activity have been documented in several studies [29-31], which are consistent with TAA's toxic effects. The findings of this study back up previous research [32,33] that found argan oil to be good for liver enzymes.

In the current study, the creatinine levels of TAA-intoxicated rats were significantly higher than those of the normal control group. TAA did not affect blood urea nitrogen or uric acid levels. The current study also found that administering argan oil to TAA-intoxicated rats increased BUN levels while decreasing uric acid levels. The current study's findings are similar to those of Alahmadi., *et al*. [34]. The authors found that applying argan oil to the skin reduced lead-induced physiological and histological changes. In a similar study, Muqati., *et al*. found that rats exposed to lead had significantly higher serum levels of uric acid and creatinine than normal control rats. Argan oil also had a positive effect on urea levels in cadmium-intoxicated rats, despite having no direct effect on uric acid or creatinine levels. Polyunsaturated and unsaturated fatty acids, polyphenols, tocopherols, sterols, and -carotene, among other active constituents of argan oil, may have a protective effect. These bioactive compounds are potent antioxidants, boosting the enzyme system that scavenges free radicals [33,36].

Lipid metabolism is disrupted by a defect in plasma lipoprotein development and clearance, which is a common, potentially fatal problem linked to a variety of diseases, including diabetes. Dyslipidemia will be used in the future to predict the onset of diabetes. Diabetic dyslipidemia is characterized by hypertriglyceridemia, hypercholesterolemia, and low HDL-c levels [37,38]. LDL-c and VLDL-c levels are also elevated. (40) Paraphrase that has been formalized.

Giving rats argan oil had no effect on their cholesterol, triglyceride, LDL-c, or VLDL-c levels, according to the current study. However, supplementing TAA-intoxicated rats with argan oil significantly increased HDL-c levels in the current study. Muqati., *et al*. [34] conducted research to back up this assertion. Regular treatment

of cadmium-intoxicated rats with argan oil exhibited a significant increase in serum HDL-c levels, according to the authors. HDL-c is a heart-healthy lipid that is thought to play a role in the transport of cholesterol from peripheral cells to the liver. In laboratory animals exposed to heavy metals and pesticides, some medicinal plants were proved to be effective in lowering LDL-c and increasing HDL-c levels [41-43].

Conclusion

From the data we concluded that TAA caused liver damage. However, application of the argan oil facilitated the recovering from TAA-induced physiological changes in the male rats. The oil argan oil also improved the antioxidant response in the liver which could be a beneficent aspect of the recovery form intoxication.

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