The Potential Effects of Doum and Mustard Seeds on Raising the Fertility Level of Male Rats

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Abstract

This study was conducted to investigate the effect of Doum and Mustard seeds powder on fertility level of male rats. Thirty mature male rats weighting 160 ± 10 g were randomly distributed into equal five groups. Six rats served as control negative group while twenty four rats were injected by two doses of cadmium chloride ($CdCl_2$, 0.1%) at 0.1 ml /100g body weight intraperitoneal to induce sterility.These rats were reclassified into control positive group and three treated groups that fed on standard diet containing 5% Doum, 5% Mustard and 5% their mixture. The study period was 28 days. At the end of the experiment blood samples were collected for determination of serum levels of testosterone (T), follicle-stimulating hormone (FSH) and luteinizing hormone (LH), liver functions markers (GOT, GPT, ALP), kidney functions markers (urea, creatinine and uric acid), serum glucose level and lipid profiles (TC, TG, HDL, LDL and VLDL). The testicles were extracted for a pathological examination and measured the activity of antioxidant enzymes (SOD, GPx and CAT). The results showed that consuming the powder of Doum, Mustard and thier mixture at 5% for 28 days caused a significant increases in serum levels of HDL , T, FSH and LH hormones and testes tissue antioxidant activities associated with alleviation of testicular degeneration but with significant decreases in the rest of the analyses referred to previously, as compared with control positive group. In conclusion, the administration of Doum and Mustard can lower the side effects of cadmium chloride testicular damage and improve the health status of testis with increase of reproductive potential . Doum and Mustard can be considered as one of aphrodisiacs.

Key words: *sterility, Doum, Mustard, testosterone, cadmium chloride, rats.*

Introduction

Infertility is one of the most serious social problems facing advanced nations. In general, approximate half of all cases of infertility are caused by factors related to the male partner **(Kenkel *et al.*, 2001)**. To date, various treatments have been developed for male infertility and are steadily producing results. However, there is no

effective treatment for patients with non-obstructive azoospermia, in which there is an absence of mature sperm in the testes. Although evidence suggests that many patients with male infertility have agenetic predisposition to the condition, the cause has not been elucidated in the vast majority of cases **(Matzuk and Lamb, 2002;Gurunath *et al.*, 2011).**

Many diseases such as coronary heart diseases, diabetes mellitus and chronic liver diseases as well as insufficient vitamins intake have deleterious effect on spermatogenesis and production of normal sperm **(Mosher and Pratt, 1991; Mahgoup and El-Medany, 2001; Agbaje *et al.*, 2007 and Abdulbari *et al.*, 2009).** However, intake of natural antioxidants with vitamin E and C protected sperm DNA from oxidative stress in rat testes **(Jedlinska *et al.*, 2006).**

Plants are considered to have valuable health promoting effects mainly due to the high levels of wide range of antioxidant compounds present in their tissues **(Liu, 2003 and Moselhy and Ali, 2009).**

Doum (*Hyphaene thebaica*) belongs to the Family *Palmae* and subfamily *Borassoideae*. The tree is found in countries such as Egypt, Senegal, Sudan, Central Africa Doum fruit has a high-quality protein varied between 2.86 and 5.01%, high proportion of lysine and cysteine of crude protein varied between 4.09–4.16% and 0.2–1.62%, respectively, the limited amino acid threonine, crude fat varied between 1.2 and 8.4%, crude fiber varied between 52.26 and 66.5%, the most important carbohydrates component was mannose varied between 13 and 75.9%, also the presence of calcium, magnesium, potassium, iron sodium and negligible amount of nickel, cobalt and molybdenum. Phytochemical compounds of Doum fruit such as tannins, saponin, steroids, glycosides, flavonoid, terpenes and terpinoids were found at low and moderate concentrations **(Auwal *et al.*, 2013)**.

Mustard (*Brassica nigra*) seeds belong to the mustard plant. Mustard plant is a part of *cruciferous* plant family. This same family of plant includes Cabbage, Brussels sprouts, Broccoli and even Cauliflower.Mustard seed is the second most popular spice that is traded around the world.Mustard has been mentioned around 5 times in the Bible. It has once been mentioned as the greatest herb ever **(Zohary *et al.*, 2012)**.

Mustard seeds are a very popular ingredient in the American cuisine **(Zohary *et al.*, 2012)**. Benefits of mustard seeds are many and popularly used for taste generally in hot dogs, where mustard sauce is very much preferred. It also has

medicinal applications dating back to the time of Hippocrates.It is available in white, brown and black varieties and is used by people all over the world. Greeks, Romans, Asians and Africans have all explored the taste of mustard seeds and have integrated them into their cuisines. Mustard seeds also find their place in the Bible and their first usage record is found in the Sanskrit scripts that date back to thousands of years **(Zohary *et al.*, 2012)**.

Mustard paste is said to be a part of the easiest and useful home remedies for fertility. It is also quite easy to use.You need to take at least four tablespoons of mustard seeds and grind them to form a fine paste.This paste can be used on a daily basis starting from the fourth day of the normal menstrual cycle to improve fertility**(Alina, 2020).**

Mustard plants come in several dozen varieties, all of which are rich in nutrients.Their leaves contain significant amounts of calcium, copper, and vitamins C, A, and K, while their seeds are particularly rich in fiber, selenium, magnesium, and manganese**.** Mustard contains antioxidants and other beneficial plant compounds thought to help protect the body against damage and disease.it's a great source of glucosinolates which may help prevent cancer cells from growing or spreading.Mustard is rich in glucosinolates and powerful antioxidants, both of which promote health and may protect against various diseases **(Alina, 2020).**Therefore**,** this study aimed to investigate the effect of doum , mustard and their mixture on fertility levels with testicular damage induced by cadmium chloride.

Materials and Methods

Materials

- **Plants** Doum and Mustard were obtained fromAgricultural Seed, Spices and Medicinal Plants Co. (Harras), Cairo, Egypt.
- **Experimental animals** Thirty adult male albino rats, Sprague Dawley, weighing 160 $\pm$ 10 g were purchased from Medical Insects Research Institute, Dokki, Cairo, Egypt. Rats were housed in environmentally controlled atmosphere and were fed on standard diet according to AIN-93 guidelines **(Reeves *et al.*, 1993)**
- **All chemicals** Solvents and buffers in analytical grade, cadmium chloride, vitamin and salt mixtures components used for rats feeding were purchased from El-Gomhoriya Company for Trading Drugs, Chemicals and Medical Instruments Cairo, Egypt. Casein was obtained from Morgan Chemical Co., Cairo, Egypt.

Methods

- **Doum and Mustard powder preparation**: Doum and Mustard were powdered by electric grinder (Moulinex, France), packed in dusky stoppard glass bottles until use at at room temperature.
- **Basal diet** The basic diet prepared according to the following formula as mentioned by **AIN, (1993)** as follow: protein (10%), corn oil (10%), vitamins mixture (1%), mineral mixture (4%), choline chloride (0.2%), methionine (0.3%), cellulose (5%), and the remained is corn starch (69.5%). The used vitamin mixture component was that recommended by **Campbell, (1963**) while the salts mixture used was formulated according to **Hegested *et al.*,(1941).**

Induction of rat sterility

Normal healthy male albino rats were injected by cadmium chloride ($CdCl_2$, 0.1%) at 0.1ml/100g body weight, twice during the experiment **(Rekha *et al.*,2009)**. Cadmium, a toxic heavy metal is an effective short-and ion cadmiuma toxic heavy metal with short- and long-term effects particularly showing accumulation in organs as kidney, liver, brain and testis (**Holt and Webb,1987).**

Experimental design

All rats were fed on standard diet for one week for adaptation, then rats were randomly divided into two main groups, the first group, negative control group (n=6) fed standard diet, and the second group: sterility groups (n=24) were injected with a dose of Cadmium chloride ($CdCl_2$, 0.1%) at 0.1ml/100g body weight, twice during the experiment **(Rekha *et al.*, 2009)** and divided into four groups (6 rats per each),as follow: group 2: positive control group fed standard diet and group 3,4 and 5 fed on standard diet containing 5% Doum , Mustard and their mixture, respectively. At the end of the experiment (28 day), rats were fasted overnight and anesthetized with diethyl ether. Blood samples were collected into a dry clean centrifuge glass tubes. Serum was separated by centrifugation at 4000 rpm for 15 minutes at room temperature according to **Schermer (1967)**. Serum was carefully aspirated and transferred into clean quiet fit plastic tubes and kept frozen at (-20 C°) until analysis.

Hormonal assay

Serum testosterone concentration was measured by enzyme-linked immunosorbant assay (ELISA) according to **McCann and Kirkish (1985)**. Serum levels of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) hormones were determined by an enzyme-linked immunosorbent assay (ELISA) Using specific commercial kits (Amersham, Buckinghamshire, UK) According the method

described by **Ballester *et al.*, (2004).** Superoxide dismutase (SOD), catalase (CAT)and glutathione peroxidase (GPx) enzymes were estimated in testis tissue according to **Nishikimi *et al.*, (1972)** and **Aebi, (1984)** .The tissue homogenate was prepared from the testis according to **Combes *et al.*, (1987).** Alanine amino transferase (ALT), Aspartate amino transferase (AST) and alkaline phosphatase (ALP) were estimated according to the method of **Tietz (1976), Henry, (1974) and Moss (1982),** respectively. Serum urea , creatinine and uric acid were determined according to **Patton and Crouch (1977)** , **Schirmeister, (1964)** and **While *et al.*, (1970)** . The serum levels of glucose was determined according to **Kaplan (1984).**Serum triglycerides (T.G) ,cholesterol, high density lipoprotein cholesterol (HDL-c) were measured according to **Fossati and Principe, (1982)** , **Richmond, (1973)** , **Allain, (1974) , respectively** .Serum low density lipoprotein cholesterol (LDL-c) was calculated as mg/dl according to **Castelli *et al.*, (1977)** equation:

LDL Concentration mg/dl =Total Cholesterol- HDL -VLDL

Serum very low density lipoprotein cholesterol (VLDL-c) was calculated as mg/dl according to **Lee and Nieman, (1996)** equation:

VLDL-C concentration mg/dl =T.G /5

Histological procedure

Specimens from liver were collected after fixing in formalin, embedded in paraffin,4-6 thick sections were prepared and stained with hemetoxlin and eosin according to **Bancroft *et al.*, (1996)**

The fixed specimens of testes were then trimmed, washed and dehydrated in ascending grades of alcohol.These specimens were cleared in xylene, embedded in paraffin,sectioned at 4-6 microns thickness and stained with Hematoxylin and Eosin (H & E) then examined microscopically according to **Carleton (1978).**

Statistical analysis

The data were statistically analyzed using a computerized COSTAT program by one-way ANOVA. The results are presented as mean±SD. Differences between treatments at $p \leq 0.05$ were considered significant according to **Snedecor and Cochran (1986).**

Results and Discussion

Effect of doum and mustard and their mixture combination on serum levels of total testosterone (T),(FSH) and (LH) hormones in rats with testicular damage

Data recorded in Table 1 shows that there was a significant decrease in total testosterone (T) , FSH and LH hormones in rats with testicular damage induced by cadmium cloride . Treatment with doum , mustard and their mixture led to significantly($P \leq 0.05$) increase in previous parameters in rats with testicular damage as compared with control positive group.

Table (1): Effect of doum and mustard and their mixture on serum levels of total testosterone (T),(FSH) and (LH) hormones in rats with testicular damage

Groups	T (ng/ml)	FSH (ng/ml)	LH (ng/ml)
Group(1): negative control	$5.16^{a}\pm0.65$	$9.46^{a}\pm0.89$	$2.30^{a}\pm0.20$
Group (2): positive control	$2.26^{d}\pm0.37$	$4.50^{c}\pm0.50$	$0.79^{c}\pm0.05$
Group (3): 5% doum	$3.10^{c}\pm0.20$	$5.60^{c}\pm0.52$	$1.19^{b}\pm0.01$
Group (4): 5% mustard	$4.06^{b}\pm0.51$	$7.50^{b}\pm0.50$	$1.53^{b}\pm0.35$
Group (5): 5% mixture	$4.90^{a}\pm0.36$	$9.23^{a}\pm0.75$	$1.96^{a}\pm0.12$
LSD	0.813	1.192	0.345

Means with different superscript letters in the same column are significant differentat $P \leq 0.05$.

These findings were similar to those of **Williamson *et al.*, (1996)** who reported that medicinal plants have been reported to possess anti sterility effects by various mechanism of actions. One of the major actions is their effect on sex hormones particularly for suppressing fertility, regularizing menstrual cycle, relieving dysmennoroea, treating enlarged prostate, menopausal symptoms. Moreover, plants with estrogenic property can directly influence pituitary action by peripheral modulation of luteinzing hormone (LH) and follicle stimulating hormone (FSH), decreasing their secretions and blocking ovulation **(Brinker, 1997)**.Looking forward to the tradition of using herbal medicines, which have minimum and less side effects **(Jain *et al.*, 2012).** However, in the recent past much interest has been shown to control regulation of fertility by using medicinal plants **(Chowdhury *et al.*, 2001),** fertility regulation comprising contraception and management of infertility forms an important component of reproductive health **(Allag and Rangari, 2002).** Mustard

paste is said to be a part of the easiest and useful home remedies for fertility. It is also quite easy to use.You need to take at least four tablespoons of mustard seeds and grind them to form a fine paste.This paste can be used on a daily basis starting from the fourth day of the normal menstrual cycle to improve fertility**(Alina, 2020).**

Effect of doum and mustard and their mixture on the activity of testicular antioxidant enzymes

Data recorded in Table 2 show that the treatment with doum and mustard and their mixture caused significant increases in super oxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) activities in rats with testicular damage induced by $CdCl_2$ compared with control positive group.

Table (2): Effect of doum and mustard and their mixture on the activity of testicular antioxidant enzymes

Groups	SOD (u/mg protein)	GPx (nmol/min/mg protein)	CAT (nmol/min/mg protein)
Group(1): negative control	23.36^{a}±1.955	247.16^{a}±2.478	380.53^{a}±1.464
Group (2): positive control	11.16^{d}±1.150	134.2^{e}±1.907	283.93^{e}±1.386
Group (3): 5% doum	14.9^{c}±1.374	155^{d}± 2	302.76^{d}±1.985
Group (4): 5% mustard	18.43^{b}±1.497	187^{c}±2.645	332.86^{c}±2.608
Group (5): 5% mixture	21.26^{a}±1.184	232.5^{b}±2.364	373.17^{b}±2.532
LSD	2.659	4.178	3.748

Means with different superscript letters in the same column are significant differentat P≤0.05.

Doum showed a well-known plant for its antioxidant, anticancer and anti-Inflammatory potential because of its phenolic and flavonoid content was explored for its antimicrobial potential against various Gram-positive and Gram-negative bacteria and fungal pathogens **(Hossam *et al.*, 2018**). Antioxidant activity of the plants is attributed to their phytochemicals such as flavonoids, phenolic acids and polyphenolic compounds. They play an important role in cancer, emphysema, cirrhosis, atherosclerosis, aging and various other degenerative diseases by neutralizing free radicals naturally occurring in human metabolism, lead reducing the oxidative damage **(Soong and Barlow, 2004; Patricia *et al.*, 2005).** Therefore, they

can be used as their possible utilization in foods or functional foods and pharmaceutical supplements.

Doum contains high levels of flavonoids and phenols that have antioxidant properties also, it is known that phenolic compounds act as antioxidants because of their ability to give the hydrogen molecule and in addition to molecule inhibiting lipid oxidation (**Huyut *et al.*, 2017).**

The results agreed also with the ones reported by **Abd el Halim, (2020**) who showed that doum fruit extract can increase the level of CAT and SOD in diabetic rats but decrease the level of MDA. Also**,** Mustard is rich in glucosinolates and powerful antioxidants, both of which promote health and may protect against various diseases **(Alina, 2020).**

Effect of doum and mustard and their mixture on liver functions enzymes activities of rats with testicular damage

Effect of doum and mustard and their mixture on GOT ,GPT and ALP in rats with testicular damage induced by cadmium cloride are recorded in Table (3).Results indicated that the mean values of positive control group was significantly higher than that of negative control group (healthy rats) concerning GOT ,GPT and ALP .The mean values of G3, G4, and G5 were lower than that of positive control group. Rats fed on 5% mixture (G5) recorded as the best treatment for GOT ,GPT and ALP .

Table (3): Effect of doum and mustard and their mixture on liver functions enzymes activities of rats with testicular damage

Groups	**GOT** (U/L)	**GPT**(U/L)	**ALP**(U/L)
Group(1): negative control	$92.2^{e}\pm2.740$	$40.43^{e}\pm2.458$	$171^{e}\pm3$
Group (2): positive control	$247.8^{a}\pm2.662$	$212.5^{a}\pm2.551$	$357.76^{a}\pm2.478$
Group (3): 5% doum	$193.33^{b}\pm3.055$	$155.66^{b}\pm2.081$	$292.43^{b}\pm2.615$
Group (4): 5% mustard	$124.66^{c}\pm2.516$	$104.66^{c}\pm2.516$	$247.86^{c}\pm2.557$
Group (5): 5% mixture	$107.86^{d}\pm2.557$	$72.93^{d}\pm2.700$	$193^{d}\pm3$
LSD	4.934	4.494	4.984

Means with different superscript letters in the same column are significant differentat P≤0.05.

The present study is in accordance with **Al-Masri and Riyadh (2012)** who reported that the previous studies indicated that the doum fruit extract had no any bad

effect on the liver, it can improve the liver functions enzymes. Also, **Abd el Halim, (2020**) showed that treatment with doum fruit extract significantly decreased the levels of ALP .Meanwhile no significant difference was found in ALT and AST among all treated groups as compared to the diabetic rats.

Benson and Devi (2009) showed that treatment of rats with mustard oil increased SOD also, **Khaled (2018)** reported that mustard have powerful antioxidant and hepatoprotective properties against paracetamol induced free radicals damage in the liver. The free radicals scavenging effects of mustard could be attributed to its higher polyphenols. Polyphenols are the most significant compounds for the antioxidant properties of plant raw materials **(Rice-Evans *et al.*, 1997).** The antioxidant activity of polyphenols is mainly due to their redox properties, which allow them to act as reducing agents, hydrogen donors, singlet oxygen quenchers, metal chelators **(Carocho and Ferreira, 2013).**

Effect of doum and mustard and their mixture on kidney functions of rats with testicular damage

Data presented in Table 4 showed the effect of doum , mustard and their mixture on urea , createnine and uric acid in rats with testicular damage induced by Cadmium Cloride. The highest urea , creatinine , and uric acid level was found in blood plasma of rats with testicular damage induced by Cadmium Cloride. Treatment with doum and mustard and their mixture significantly decreased the levels of urea, createnine and uric acid of rats with testicular damage .

Table (4): Effect of doum and mustard and their mixture on kidney functions of rats with testicular damage

Groups	**Urea**(mg/dl)	**Creatinine**(mg/dl)	**Uric acid**(mg/dl)
Group (1): negative control	$20.53^{c}\pm2.059$	$0.309^{c}\pm0.10$	$1.53^{c}\pm0.45$
Group (2): positive control	$32.20^{a}\pm2.1$	$0.900^{a}\pm0.10$	$4.50^{a}\pm0.50$
Group (3): 5% doum	$29.00^{b}\pm1$	$0.736^{ab}\pm0.14$	$4.06^{a}\pm0.40$
Group (4): 5% mustard	$26.76^{b}\pm1.42$	$0.533^{bc}\pm0.15$	$3.23^{b}\pm0.25$
Group (5): 5% mixture	$22.43^{c}\pm1.50$	$0.453^{c}\pm0.06$	$1.96^{c}\pm0.15$
LSD	3.039	0.216	0.682

Means with different superscript letters in the same column are significant different at P≤ 0.05.

These results are in agreement with those of **Hsu et al.,(2006)** who reported that doum extract is rich in antioxidants as well as a large amount of water-soluble phenolic contents, Due to the high nutritional value, it is therefore used in treating different health problems and improving liver and kidney functions.

These findings also were similar to those of **AbdEl-Moniem *et al.*, (2015**) who showed that doum may be advised as a good choice that can delay diabetic renal complications. it can reduce urea ,creatinine and uric acid. On the other hand **Rahman *et al.*, (2018)** showed that mustard extracts have Diuretic activity.

Effect of doum and mustard and their mixture on serum glucose level of rats with testicular damage

The data in Table 5 illustrate a significant increase in blood glucose level in group 2 compared to that of normal control rats (group 1). While treatment with doum , mustard and mixture of them caused a significant decreases in blood glucose levels in rats with testicular damage induced by Cadmium Cloride. The increase in blood glucose may indicate disrupted carbohydrate metabolism due to enhanced breakdown of liver glycogen, possibly mediated by increase in adrenocorticotrophic and glucagon hormones and/or reduced insulin activity.

Table (5): Effect of doum and mustard and their mixture on serum glucose level in rats with testicular damage

Groups	**Glucose** (mg/dl)
Group (1): negative control	$80.53^{e}\pm2.577$
Group (2): positive control	$225.43^{a}\pm2.458$
Group (3): 5% doum	$197.76^{b}\pm2.417$
Group (4): 5% mustard	$137.66^{c}\pm2.081$
Group (5): 5% mixture	$114.83^{d}\pm2.433$
LSD	4.365

Means with different superscript letters in the same column are significant different at P≤ 0.05

These results are in agreement with those found by **Bayad, (2016)** who reported that giving doum extract orally led to significant decrease in blood glucose. The doum extract has an effective ability in reducing blood glucose because it plays the role of insulin when glucose enters to the cells and achieving optimal use of glucose **(Abdel-Rahim *et al.*, 2011) .**

Also, **Abd el Halim, (2020**) reported that the levels of insulin level in rats treated of doum extract decreased to be near that of the control negative group.Therefore, doum extract has an effective role to keep the insulin hormone at normal levels

On the other side, These results are in agreement with those found by **Valavala *et al.*, (2011)** who demonstrated that Mustard can be effective against hyperglycemia-induced oxidative and osmotic stress as well as the subsequent development of diabetic cataract **(Thirumalai *et al.*, 2011 and Szőllősi , 2020**).

Effect of doum and mustard and their mixture on lipid profiles of rats with testicular damage

Effect of doum, mustard and their mixture on blood lipid profile is presented in Table 6. The results indicated that levels of total lipid, triglyceride, Total cholesterol and LDL were higher in positive control group compared with normal control rats. While treatment with doum , mustard and mixture of them significantly caused decreases in the total lipids, triglyceride, total cholesterol and LDL of treated groups as compared to the diabetic rats. On the other hand the value of HDL increased in all treated groups as compared with positive control group.

Table (6): Effect of doum and mustard and their mixture on lipid profiles of rats with testicular damage

Group	T.G (mg/dl)	Chol. (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
Group (1):negative Control	$157.76^{e}\pm1.965$	$122.9^{d}\pm2.882$	$66.76^{a}\pm1.601$	$24.53^{e}\pm3.602$	$31.533^{e}\pm0.393$
Group (2): positive control	$267.90^{a}\pm2.406$	$182.36^{a}\pm2.510$	$24^{e}\pm2.645$	$104.78^{a}\pm3.404$	$53.58^{a}\pm0.481$
Group (3): 5% doum	$212.50^{b}\pm2.364$	$162.76^{b}\pm1.497$	$32.466^{d}\pm2.335$	$87.8^{b}\pm1.775$	$42.5^{b}\pm0.472$
Group (4): 5% mustard	$172.86^{c}\pm2.402$	$144^{c}\pm2.645$	$54.33^{c}\pm2.516$	$55.093^{c}\pm3.761$	$34.573^{c}\pm0.480$
Group (5): 5% mixture	$168.53^{d}\pm2.236$	$125^{d}\pm3$	$60.4^{b}\pm1.637$	$30.893^{d}\pm3.729$	$33.706^{d}\pm0.447$
L.S.D	4.150	4.663	3.988	6.076	0.830

Means with different superscript letters in the same column are significant different at P≤ 0.05

These results are supported by the results published by **Bayad, (2016)** who showed that doum fruit extract has an effective ability in reducing level of fats and triglycerides.Also, the treatment with doum extract can cause an increase in HDL-cholesterol at higher concentrations 250 mg/kg body weight (**Abdulazeez *et al.*, 2019**)**.** It is known that high levels of blood cholesterol and LDL are risk factors for cardiovascular disease, while HDL is involved in reverse cholesterol transport carring, cholesterol and cholesterol esters from the peripheral tissues and cells to the liver, where cholesterol is metabolized into bile acids, which reduces tissues cholesterol levels(**Kamis *et al.*, 2003).** Also, **Abdel Halim (2020**) showed that doum fruit extract can reduce total lipid, triglyceride, Total cholesterol and LDL but the value of HDL increased in idiabetic rats .

Concearning Mustard, these results are similar to the result of **Rahman, *et al.*, (2012)** who reported that the mustard treated group was found lower the body weight than that of the control group. The monounsaturated fatty acids and proper ratio of polyunsaturated fatty acids in mustard seeds can improve heart health and keep the balance of cholesterol levels in the body, also low triglycerides and prevent obesity. Also, **Mustafizur *et al.*, (2014)** reported that the mustard oil can reduce the serum TC, LDL and TG, but increase the good cholesterol HDL level in the hypercholesterolemic rats. The stronger anticholesterol activity of mustard oil is because of ω-6 PUFAs. **Al-Badry *et al.*, (2017)** reported also that mustard oil has effect on reduce body weight and serum lipid profile and atherogenic index.

The stronger anticholesterol activity of mustard oil is because of ω-6.

Histopathological examination of Testis

Microscopic examination of different tissue sections of control rats revealed normal histological structure. The liver of control rats showed normal histological structure of the central veins, portal areas and hepatic cells **(Photo1 and 2) .**Testicular tissues of control rats showed normal seminiferous tubules, normal spermatogenesis with active sperms in the lumen of the tubules **(Photo 3 and 4).**

While examination of tissues of control positive rats showed marked histological alterations .Livers of control positive rats showed congested central veins, marked vascular degeneration and necrosis of the hepatic cells, some of them showed the signet ring appearance of the vacuolated cells, and activated Kupffer cells **(Photo 5)**, with marked cell lysis **(Photo 6).** The portal areas showed congested portal vessels, proliferation of the bile duct epithelium and mononuclear

inflammatory cells infiltration **(Photo 7).** The testis of control positive rats showed defective spermatogenesis, necrosis and nuclear pyknosis and loss of the spermatogoneal cells, interstitial edema and necrosis of the Leydig cells **(Photo 8).** Diffuse cessation of spermatogenesis was a prominent finding with necrotic changes and loss of most of the spermatogoneal cells' layers and appearance of necrotic cells debris **(Photo 9 and 10).** Regarding the treated groups, all showed variable degrees of restorative and protective effects particularly in treatente with drug 2 and 3.

Livers of control positive rats which treated with drug 1 showed diffuse moderate vascular degeneration and few necrosisof the hepatic cells **(Photo 11).** While, the testis of control positive rats which treated with drug 1 showed mild degenerative and necrotic changes of the spermtogoneal cell with restoration of the spermatogenesis in most of the seminiferous tubules **(Photo 12).** Active sperms were observed in the lumen of the later tubules.

The livers of control positive rats which treated with drug 2 showed good restoration of the hepatic parenchymal cells which appeared near to normal with only mild congestion of central veins and mild hepatocellular degeneration **(Photo 13)** and scars necrosis **(Photo 14).** The testicular tissue of those rats which treated with drug 2 showed restoration of the spermatogoneal cells' layers with active spermatogenesis in most of the seminiferous tubules with presence of active sperms in the lumen of most of the seminiferous tubules **(Photo 15 and 16).**

Livers of control positive rats which treated with drug 3 showed mild to moderate degrees of hepatocellular vascular degeneration and scattered necrosis **(Photo 17 and 18).**The testis of those rats which treated with drug 3 showed restoration of the spermatogenesis in most of the seminiferous tubules, while others showing necrosis and nuclear pyknosis of spermatogemeal cells **(Photo 19)** with presence of active sperms in the lumen of the somniferous tubules**(Photo 20).**

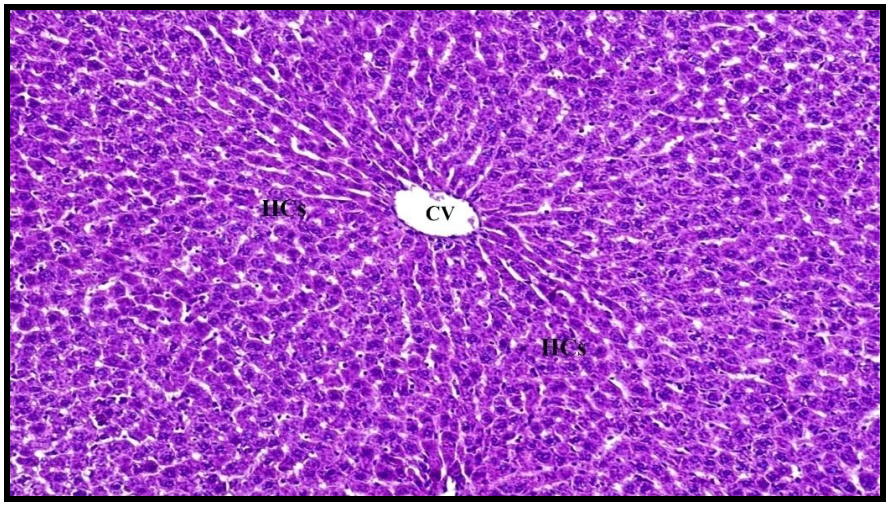

Photo (1): Liver of control rat showing normal histological structure of the central vein (CV) and hepatic cells (HCs). **(H&E, X100).**

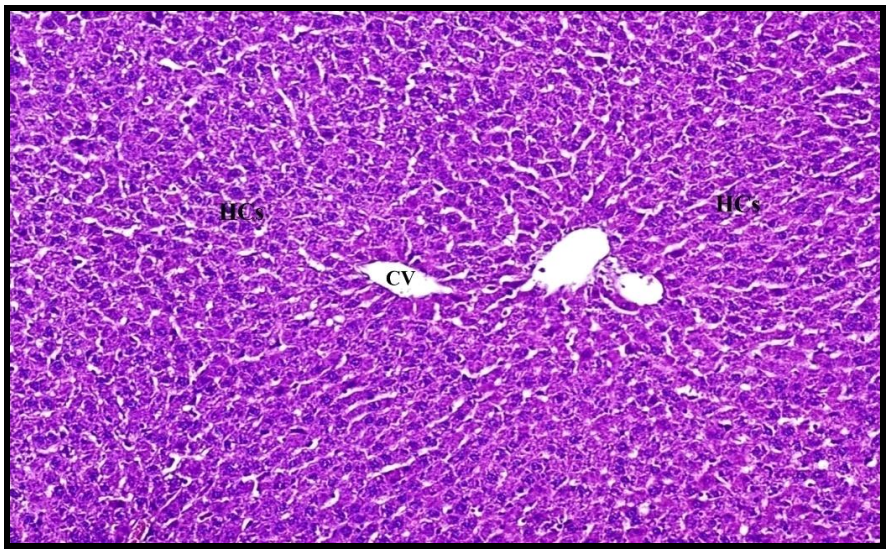

Photo (2): Liver of control rat showing normal histological structure of the central vein (CV) and hepatic cells (HCs) **(H&E, X100).**

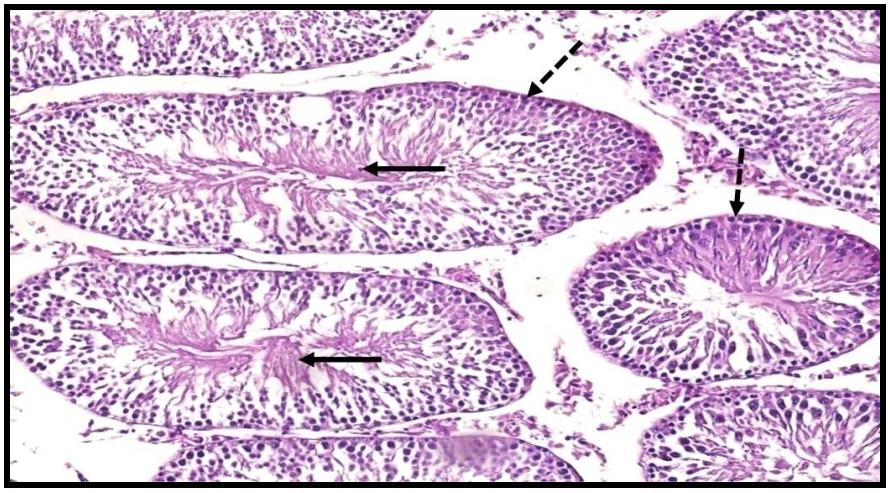

Photo (3): Testis of control rat showing normal seminiferous tubules (dashed arrow), normal spermatogenesis with active sperms (arrow) in the lumen of the tubules.**(H&E, X200).**

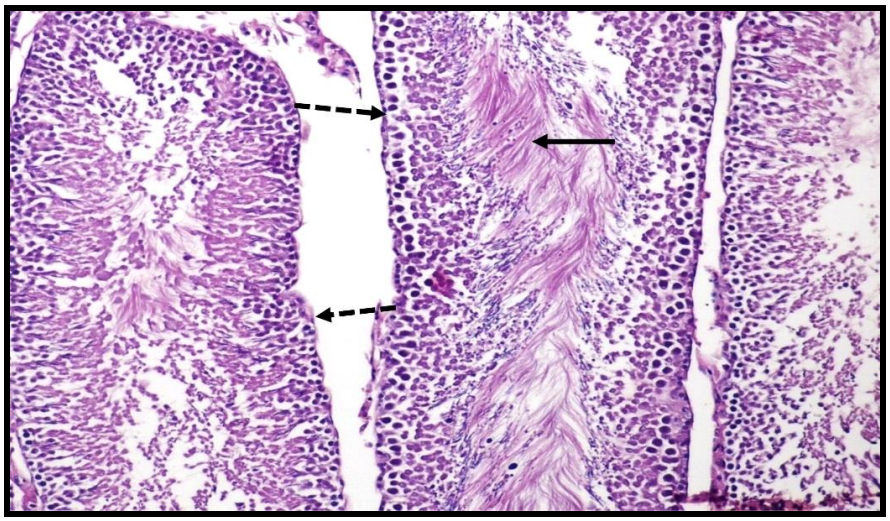

Photo (4): Testis of control rat showing normal seminiferous tubules (dashed arrow), normal spermatogenesis with active sperms (arrow) in the lumen of the tubules.**(H&E, X200).**

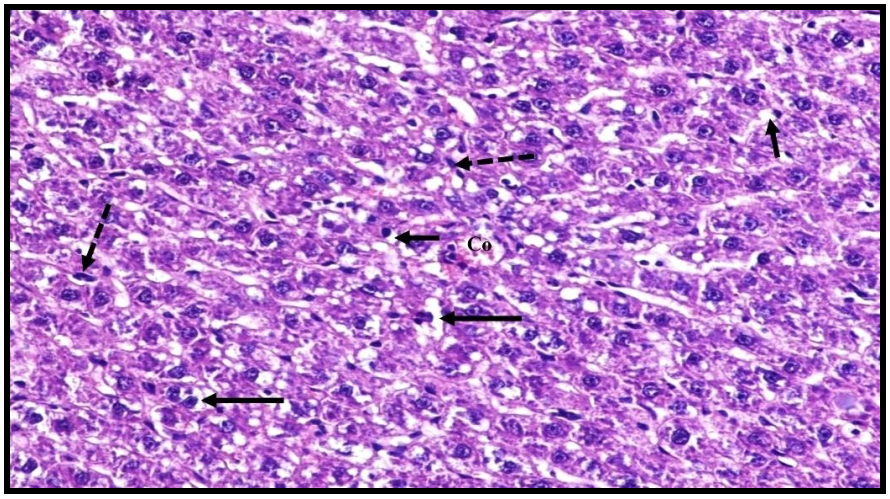

Photo (5): Liver of control positive rat showing marked vacuolar degeneration (arrow) and necrosis (dashed arrow) of the hepatic cells, some of them showing the signet ring appearance (short arrow) of the vacuolated cells, and activated Kupffer cells (dashed arrow). Notice the congested central vein (Co). **(H&E, X200).**

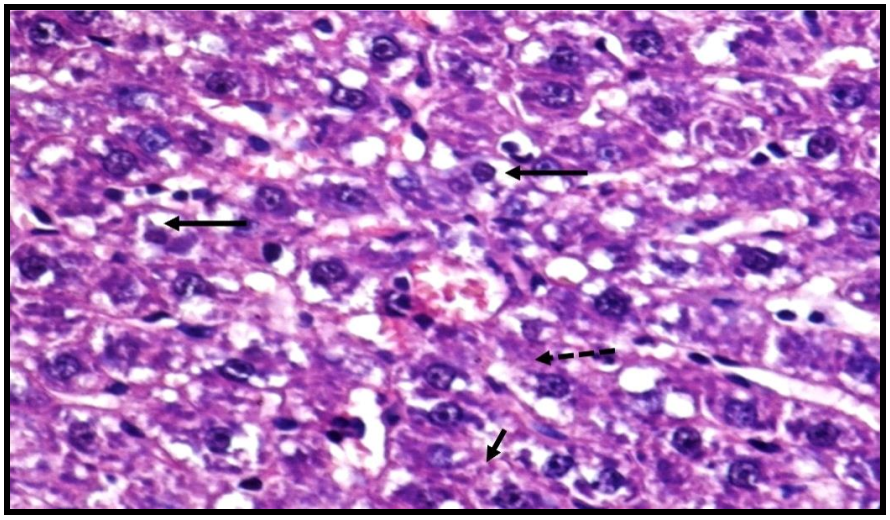

Photo (6): Higher magnification of liver of control positive rat showing the vacuolated (arrow) and necrotic (dashed arrow) cells with marked cell lysis (short arrow). **(H&E, X400).**

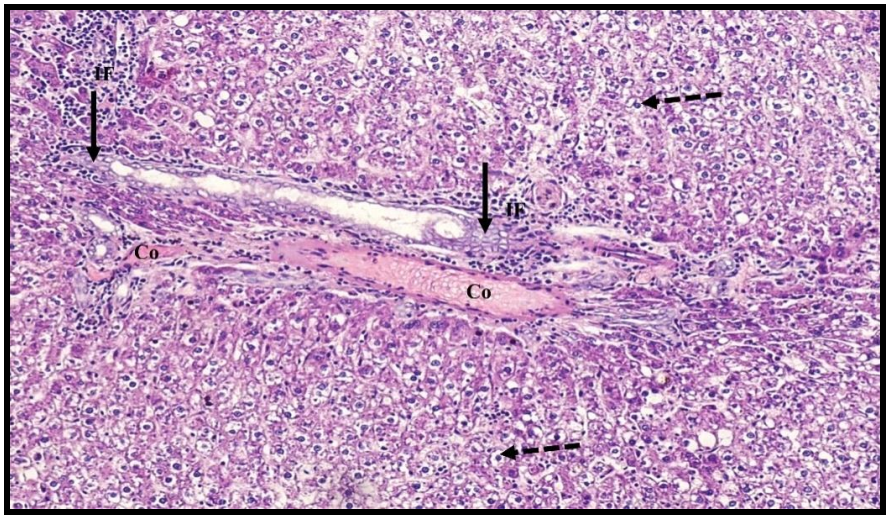

Photo (7): Portal area in liver of control positive rat showing congested portal vessel (Co), proliferation of the bile duct epithelium (arrow) and mononuclear inflammatory cells infiltration (IF), notice the diffuse hepatocellular vascular degeneration (dashed arrow) and necrosis. **(H&E, X100).**

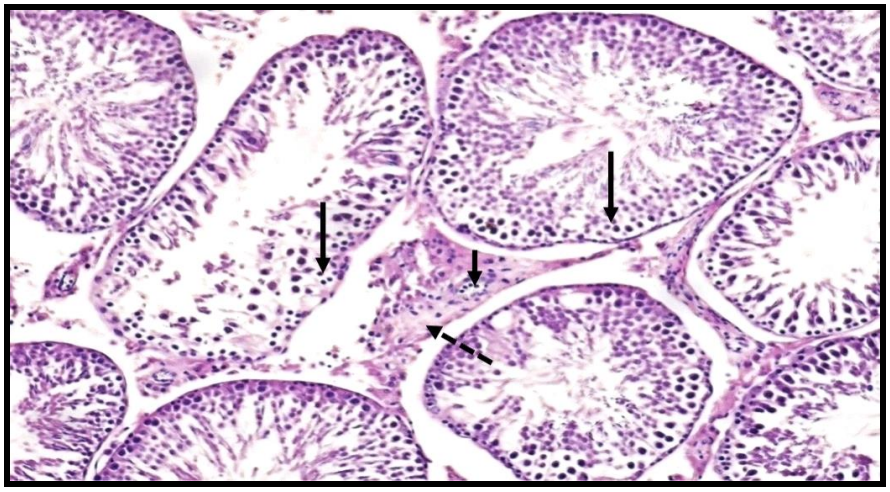

Photo (8): Testis of control positive rat showing defective spermatogenesis, necrosis and nuclear pyknosis (arrow) and loss of the spermatogoneal cells, interstitial edema (dashed arrow) and necrosis of the Leydig cells (short arrow). **(H&E, X200).**

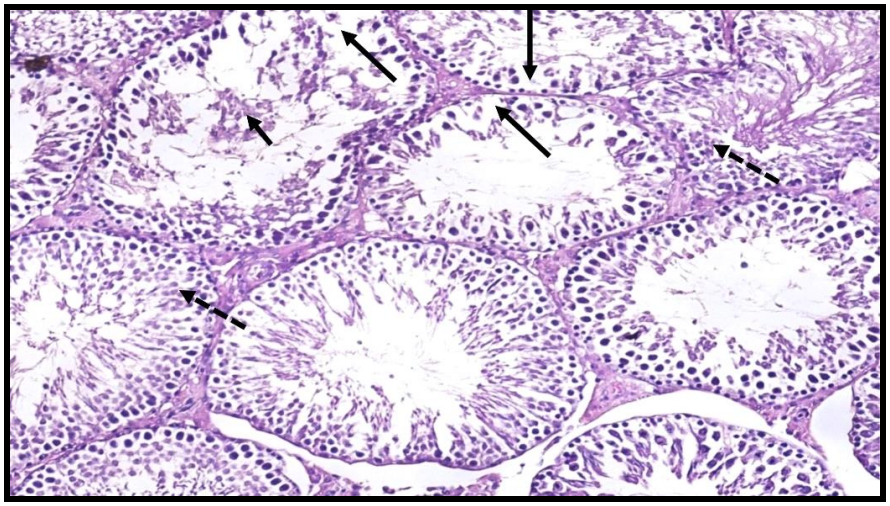

Photo (9): Testis of control positive rat showing diffuse cessation of spermatogenesis with necrotic (dashed arrow) changes and loss (arrow) of most of the spermatogoneal cells' layers with appearance of necrotic cells debris (short arrow). **(H&E, X200).**

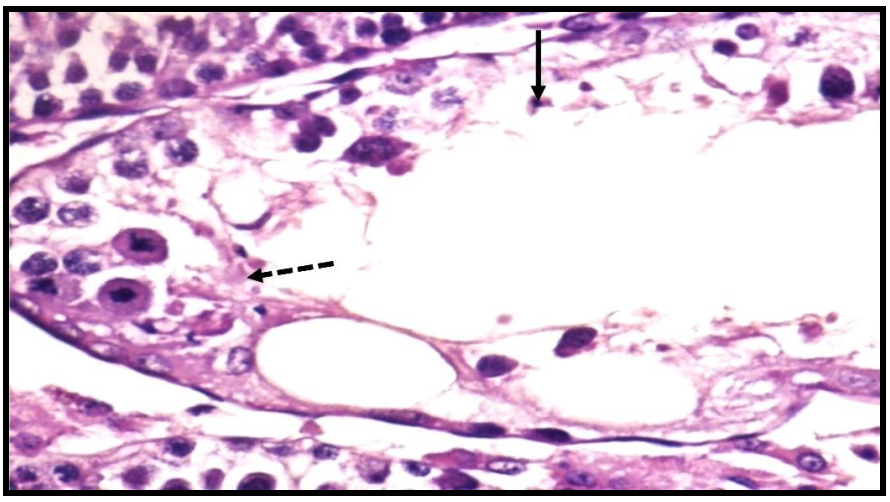

Photo (10): Higher magnification of testis of control positive rat showing loss of the spermatogonel cells, necrosis and nuclear pyknosis (arrow) of the remaining with appearance of necrotic cells debris (dashed arrow). **(H&E, X400).**

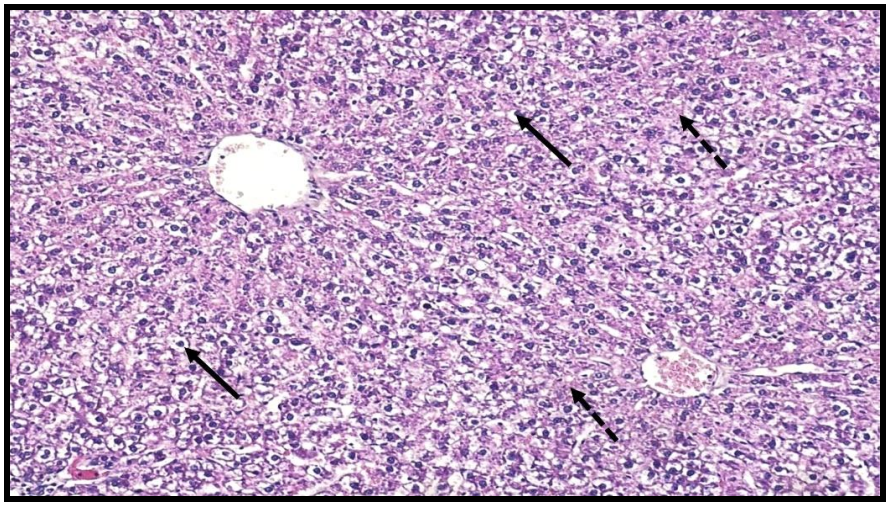

Photo (11): Liver of control positive rat which treated with drug 1 showing diffuse vacuolar degeneration (arrow) and few necrosis (dashed arrow) of the hepatic cells. **(H&E, X100).**

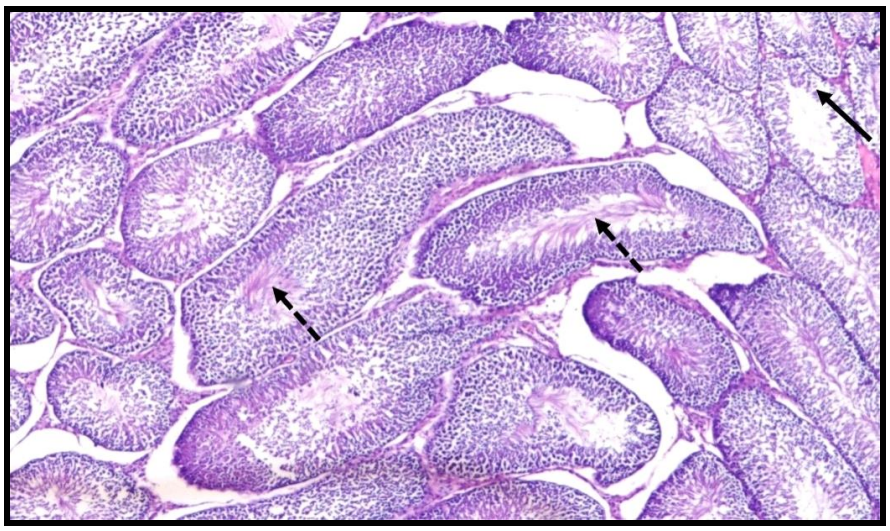

Photo (12) : Testis of control positive rat which treated with drug 1 showing mild degenerative and necrotic changes of the spermtogoneal cell (arrow) with restoration of the spermatogenesis in most of the seminiferous tubules. Notice presence of active sperms (dashed arrow) in the lumen of those tubules. **(H&E, X100).**

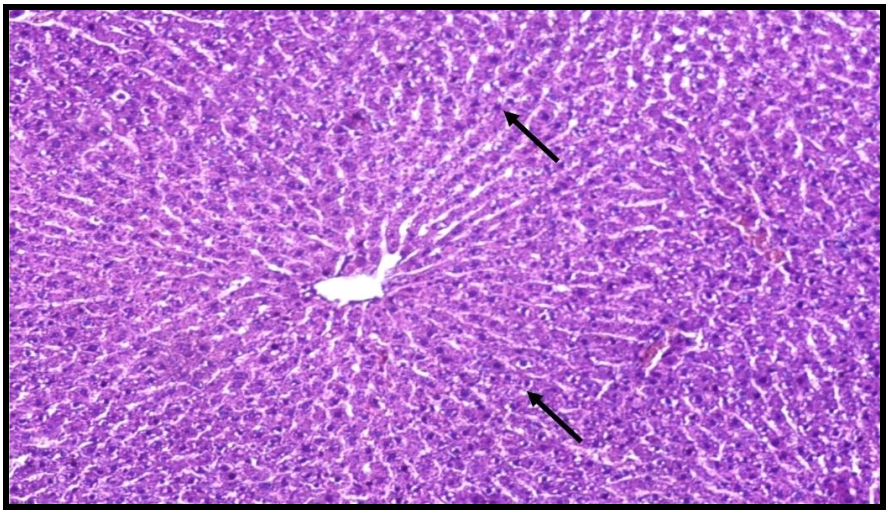

Photo (13) : Liver of control positive rat which treated with drug 2 showing good restoration of the hepatic parenchymal cells which appeared near to normal with only mild congestion of central vein and scars hepatocellular degeneration (arrow). **(H&E, X100).**

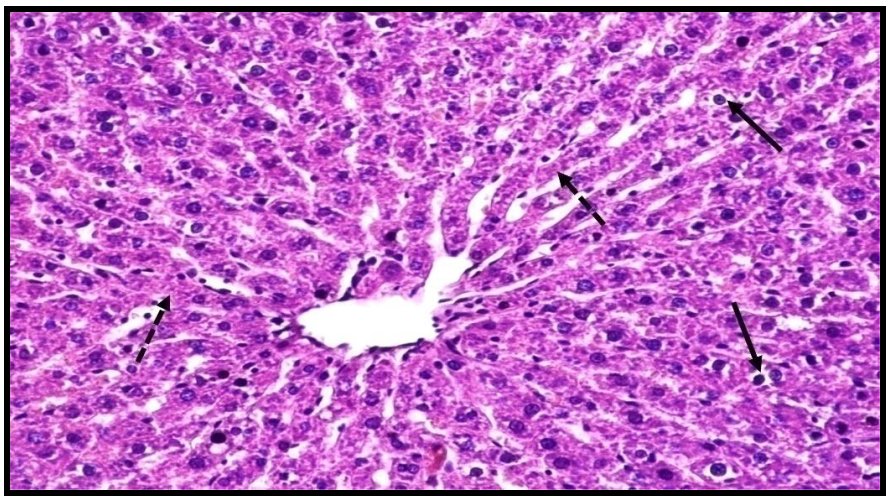

Photo (14): Liver of control positive rat which treated with drug 2 showing mild hepatocellular degenerative changes (arrow) and scars necrosis (dashed arrow). **(H&E, X200).**

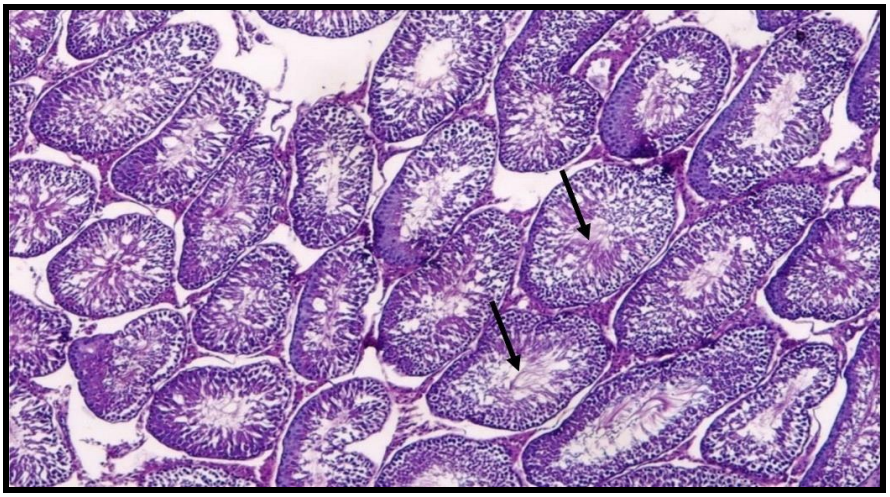

Photo (15): Testis of control positive rat which treated with drug 2 showing restoration of the spematogoneal cells' layers with active spermatogenesis in most of the seminiferous tubules with presence of active sperms (arrow) in the lumen of most of the seminiferous tubules. **(H&E, X100).**

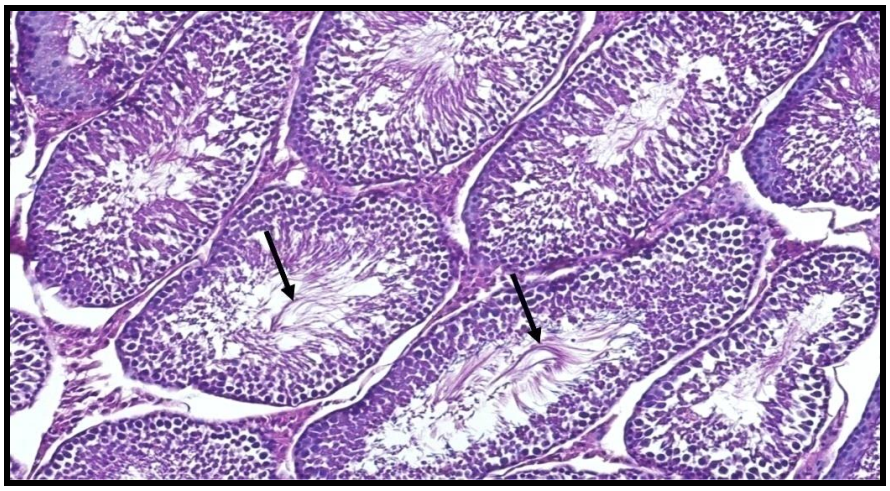

Photo (16): Testis of control positive rat which treated with drug 2 showing restoration of the spematogoneal cells' layers (SGs) with presence of active sperms (arrow) in the lumen of most of the seminiferous tubules. **(H&E, X200).**

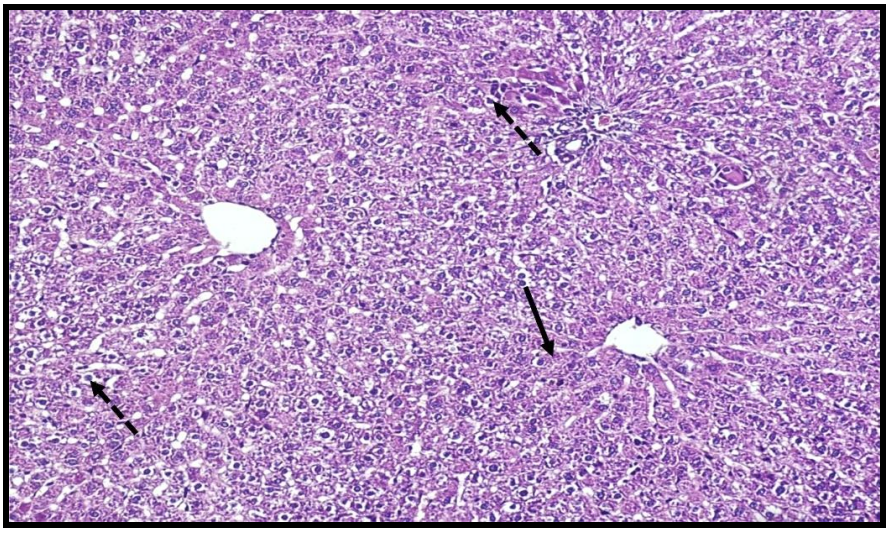

Photo (17): Liver of control positive rat which treated with drug 3 showing moderate degree of hepatocellular vacuolar degeneration (dashed arrow) and scattered necrosis (arrow). **(H&E, X100).**

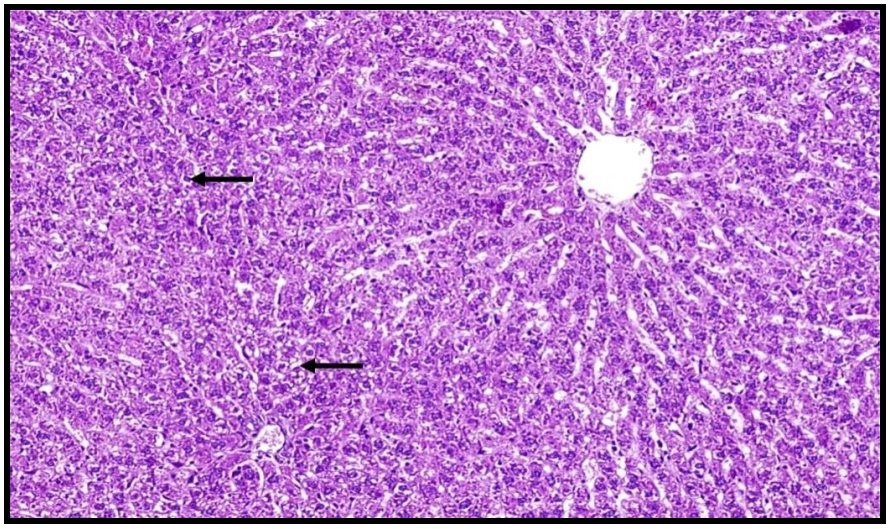

Photo (18): Liver of control positive rat which treated with drug 3 showing mild degeneration (arrow) and few necrosis of the hepatic cells. **(H&E, X100).**

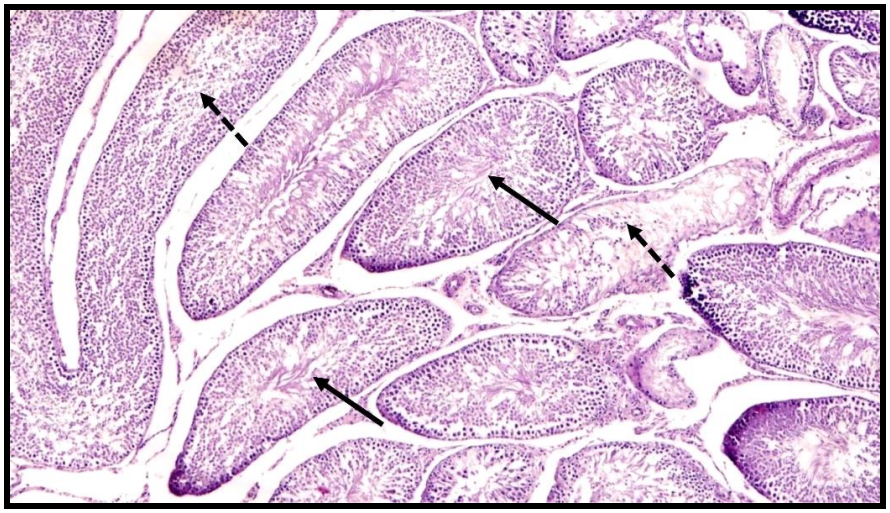

Photo (19): Testis of control positive rat which treated with drug 3 showing restoration of the spermatogenesis in most of the seminiferous tubules (arrow), while others showing necrosis and nuclear pyknosis of spermatogoneal cells (dashed arrow). **(H&E, X100).**

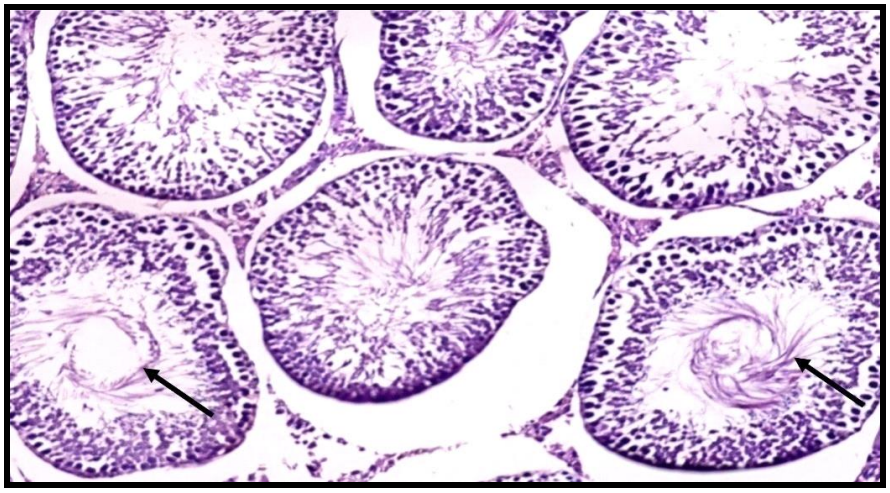

Photo (20): Testis of control positive rat which treated with drug 3 showing presence of active sperms (arrow) in the lumen of the somniferous tubules. **(H&E, X200).**

In conclusion From the present results, it can be concluded that both doum and mustard can be used to improve and raise the level of fertility . Doum and mustard can be considered as one of aphrodisiacs. it is clear that medicinal plants play an important role as anti sterility agents. Herbal anti sterility agents shows promising output by minimizing the number of adverse drug properties.

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صممت هذه الدراسة لمعرفة التأثيرات المحتملة لنبات الدوم والخردل على مستوى الخصوبة في ذكور الفئران. تم توزيع ثلاثون من ذكور الفئران تزن 150±10 جرام بطريقة عشوائية إلى خمس مجموعات متساوية. تحتوى كل مجموعة على ستة فئران. استخدم ست فئران كمجموعة ضابطة سالبة (فئران سليمة)، فى حين تم إصابة أربعة وعشرون فأر بكلوريد الكادميوم بتركيز 1% (بجرعة 1 مل/ كجم من وزن الجسم داخل التجويف البريتوني). وقد تم تقسيم هذه الفئران إلى مجموعة ضابطة موجبة (فئران مصابة)، وثلاث مجموعات أخرى قد تم تغذيتها على مسحوق نباتات الدوم والخردل، ومخلوط منهم بنسبة 5% من الوجبة الأساسية. وفي نهاية التجربة (28يوم) تم تجميع عينات الدم لقياس مستوى كل من هرمونات التستيستيرون الكلي والهرمون المنشط للحوصلة وهرمون المُلَوْتِن - وظائف الكبد- وظائف الكلى- مستوى الجلوكوز - دهون الدم كما تم إجراء الفحص الهستوباثولوجي وقياس نشاط الإنزيمات المضادة للأكسدة بأنسجة الخصية. وأظهرت النتائج أن إعطاء مسحوق نباتات الدوم والخردل وخليطهما معا بنسبة (5%) لمدة 28 يوم أدى إلى زيادة معنوية في مستويات الليبوبروتين عالى الكثافة وهرمونات التستوستيرون والهرمون المنشط للحوصلة وهرمون المُلَوْتِن والأنزيمات المضادة للأكسدة بينما أدى إلى انخفاض معنوى فى باقى التحاليل سابقة الذكر بالمقارنة بالمجموعة الضابطة الموجبة. وتوصي الدراسة بضرورة تناول الدوم والخردل حيث ساعد فى خفض الأثار الجانبية لتلف الخصية بكلوريد الكادميوم كما أنه ساعد فى تحسين الحالة الصحية للخصية مع زيادة القدرة على الإنجاب ويمكن اعتبار الدوم والخردل كمنشط جنسى.

الكلمات المفتاحية: العقم، الدوم، الخردل، هرمون التستيستيرون، كلوريد الكادميوم، فئران.