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العراقية
المجلات الأكاديمية العلمية

TJAS

Tikrit Journal for
Agricultural
Sciences

ISSN:1813-1646 (Print); 2664-0597 (Online)

Tikrit Journal for Agricultural Sciences

Journal Homepage: <http://tujas.tu.edu.iq>

E-mail: tjas@tu.edu.iq

Ali Hussein Rashid
Al-Rawi^{1*};

Ghazwan Mahdi Salih²

1-Ministry of Agriculture /
Nineveh Agricultural
Directorate

2-College of Agriculture,
Tikrit University, Department
of Food Science

KEY WORDS:

soybean, soy milk cheese,
soybean (tofu) cheese, ginger
plant, Biochemical tests,
glucose, triglycerides, liver
enzymes, kidney and liver
tissue

ARTICLE HISTORY:

Received: 09/06/2020

Accepted: 29/06/2020

Available online: 30/06/2020

Determine the Effectiveness of Tofu-Cheese Medicinal Plants in the Lipid Profile of Laboratory Rats

ABSTRACT

The biochemical study was conducted in the laboratories of the University of Tikrit, Faculty of Agriculture for the period from 1/9/2019 until 1/11/2019. The study included making soy cheese from the method of sour cheese and the cheese was fortified by adding dry ginger plant in concentrations of 0.2 and 0.4 g /100g soybean cheese and checks were made. Chemical for cheese and biochemistry of rats and blood tests were taken in the middle and end of the experiment. The results of the chemical analysis of processed soybean cheese showed a decrease in the percentage of moisture and a rise in the percentage of protein and ash in the treatments that were supported by ginger. The results of the sensory evaluation also showed the superiority of ginger fortified soybean cheese 0.4g /100g cheese compared to other treatments. The results of the biochemical study conducted on rats showed a significant decrease at the level ($p \leq 0.05$) in the level of cholesterol, glucose, triglycerides, low-density lipoproteins and the ratio of urea and creatinine to the two treatments that were supported by ginger compared with the negative and positive control. The results of the histological anatomy of the liver and kidney showed superiority. Treatments that were supported by ginger compared to the positive and negative control treatments, where a clear improvement was observed in the liver and kidney tissues and their normal appearance. Accordingly, the study aimed to manufacture of (tofu) cheese and study the effect of nutrition on soybean cheese fortified with different concentrations of ginger plant in the biochemical characteristics of blood of rats and follow-up of tissue tests of the kidneys and liver.

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INTRODUCTION

Recent years have witnessed a growing health awareness and the idea of renouncing chemical drugs because of the health risks and many side effects that they cause. Therefore, researchers interested in functional foods by making natural sources an alternative treatment for many diseases or preventing it and from these sources some unsaturated fats and some plant proteins and food fibers and others, including beans Soy, which has an antioxidant activity to protect tissues from free radicals, also has an effective and distinct role in regulating blood sugar, enhances kidney and liver functions, lowers cholesterol and blood pressure, and reduces cancer (Uchendu *et al.*, 2016). Soy milk is a substance rich in unsaturated linoleic fatty acid, which works to reduce the level of cholesterol in the blood, as this milk does not contain lactose sugar found in animal milk, and thus is useful for patients with lactose intolerance syndrome, (Ahmad & Ahmad, 2015). Food is also fortified with ginger to improve

* Corresponding author: E-mail: Alialrawi199@yahoo.com

the flavor and taste, especially foods that have low sugar, including cheese. Awaida (2015). Also, previous studies indicated that fortifying cheese with ginger improved the nutritional properties of cheese, as it was observed to increase the period of storage and improve the quality of cheese and flavor of cheese fortified with ginger compared to non-fortified cheese (Aasim et al., 2009)

Recent studies have pointed to the role of medicinal plants as antioxidants as an alternative to medications and chemical treatments, as treatment with medicinal plants and herbs has occupied a great interest and space in medicine and pharmacy as it has become a safe source for the pharmaceutical industry, and recent scientific studies and research have demonstrated the pharmacokinetic efficacy of many plant-based antagonists For oxidation and has a preventative effect of many diseases, especially cancer, in humans (Ali, 2013).

Ginger is a safe medicinal plant, and it does not have significant side effects, and it is one of the perennial plants, where its roots spread horizontally and branching in an irregular manner and the length of one branch reaches 12 cm and the color is dark yellow with a distinct aromatic smell and pungent taste and contains basic compounds that contribute to preventing the oxidation of fats such as (Gingerol, Gingerdiol, Zingerone) by maintaining the effectiveness of antioxidant enzymes such as (Glutathion peroxidase, Catalase Peroxide dismutase) (Attari et al, 2018).

MATERIALS AND METHODS

Manufacture of soy cheese: Soy cheese is made by following the steps mentioned before (Grzanich *et. al.*, 2017)

Chemical tests for soybean cheese:

Determination of the percentage of moisture: Moisture was determined according to the method of Ling (2008) with a weight of 10 g of cheese dried in an electric oven at a temperature of 105 °C until the weight remained constant.

Estimate ash percentage: The ash was estimated by the direct burning method described in (A.O.A.C, 2004).

Estimate the percentage of fat: I followed the Kerber method mentioned by (Ellefson and Min, 2010) and then read the fat column as a percentage of the fat in the cheese.

Estimate the percentage of protein: Estimate the protein as mentioned (Hool *et.al.*, 2004) and extract the protein percentage by multiplying the total nitrogen ratio by the adult conversion factor. 6.25

Estimate the percentage of carbohydrates: The ratio of carbohydrates was calculated mathematically according to what Ihekoronye (1985) mentioned by the difference method
Carbohydrate Rat (%) -100 = Ash + Protein + Fat + Moisture).

Biological Experiment:

Animals of Experiment: In this study, (20) of the adult male rats of the Sprague-Dawley strain at the age of 2-3 months were used with weights ranging from 150-160 g.

Preparing requirement food: requirement food for laboratory rats was prepared according to the National Academy of Science / National Research Council (NAS / NRC), 2002.

Design of experiment

The animals of the experiment were randomly divided into four groups, each group consisting of five animals. Each group was fed a special diet of feed and according to the type of treatment. The feeding lasted for 28 days. The experiment was divided into two phases. The first stage, which took blood tests on the fourteenth day of the experiment, and at the end of the experiment, blood tests were taken and the kidneys and liver were taken and tissue tests were performed on them.

1. First group (negative control group): these animals were left intact and fed on a standard diet only for the duration of the experiment.
2. The second group (positive control group): it was fed on a standard diet added to soybean cheese 150 grams per 850 grams a standard diet rich in animal fats throughout the experiment period.
3. The third group: This group was fed on the standard diet with a weight of 850 grams and 150 grams of soy cheese fortified with ginger at a concentration of 0.2 grams per 100 grams of soybean cheese for the duration of the experiment and we symbolize it with the symbol (A1).

4. Fourth group: The same nutrition was used in the third group above, taking into account changing the concentration of ginger in soy cheese to 0.4 grams per 100 grams of soy cheese, and we symbolize it with the symbol (A2).

Biochemical tests of blood:

Estimate the level of glucose in the blood serum: Blood serum glucose was measured according to (Schmidt *et.al.*, 20007) method using (Kit) prepared from the English company Randox, an enzymatic method in which the glucose is oxidized to the Quinonimine tincture

Estimate the serum cholesterol concentration: Determine the total cholesterol in the serum by the enzymatic method Young(2000) using the prepared kit from the English company Randox.

Estimate the concentration of triglycerides: The level of triglycerides was estimated using an English-supplied "Kit" kit based on an enzymatic analysis of triglycerides to the cholesterol, which passes through a chain of reactions to eventually produce a pink complex Youn(2000).

Estimate the concentration of high-density lipoproteins for cholesterol in the serum: The level of high-density protein lipids in the serum Youn(2000) was estimated using the Kit kit manufactured in Randox, England.

Determination of serum low density lipoprotein-cholesterol concentration (LDL-C): It was calculated based on the equation mentioned before (Faas *et.al.*, 2002) as follows:

$$\text{LDL(Mg/100ml blood)} = \text{Cholesterol} - \frac{\text{high density protein lipids} - \text{triglycerides}}{5}$$

Determination of serum very low density lipoprotein-cholesterol concentration (VLDL-C)

Calculate the VLDL-C level by the formula developed by Tietz (2005) as shown in the below:

$$\text{VLDL(Mg/100ml blood)} = \frac{\text{Concentration of triglycerides}}{5}$$

Estimate the effectiveness of liver enzymes (AST, ALT, ALK): I used the ready-made analysis kit manufactured by the English company Randox to measure the effectiveness of liver enzymes in serum depending on the method used by Young (2000).

Sensory evaluation: The sensory evaluation of all the transactions was conducted by a number of lecturers from the Department of Food Science at Tikrit University using the sensory evaluation schedule proposed by (Lhekoronye & Neoddy,1985). It was awarded for the flavor and flavor qualities 40 degrees and the strength and composition qualities 60 degrees.

Histological examination of rat livers and kidneys in laboratory transactions:

Preparing the tissue sections: The textile sections were prepared using, the Hajj (2010).

Statistical Analysis: The results of the experiments were analyzed using the Linear Model General (SAS 2004) to study the effect of factors on the complete random design CRD and Duncan test (1955) to determine the significance of the differences between the averages of the factors affecting the characteristics studied at the level of ($p \leq 0.05$).

RESULTS AND DISCUSSIONS:

Soybean milk composition used in the experiment

Table (1) below shows the chemical specifications for soybean milk used in soybean cheese production. As the percentage of both fat was 2.13%, carbohydrates 3.65%, protein 3.33%, humidity 90.30%, ash 0.59%, and these results are consistent with the findings of the military The researcher Al-Jishi (2018)in his study on soy milk ingredients that reached the percentage of fat, ash and moisture (2,15,0.50 , 90.22%), respectively.

Table (1) chemical soybean milk composition used in soy cheese production

Component	lipid	Carbohydrates	Protein	Humidity	Ash
percentage (%)	2.13	3.65	3.33	90.30	0.59

The chemical composition of soybean cheese

Table (2) shows the chemical composition of both soybean cheese and soybean cheese supported by ginger, as it is noted from the table that the results of moisture content immediately after manufacturing were 68.1% and protein ratios (18.2%) and fat (9.72%) and ash(0.736%) And carbohydrates (3.244%), as this result agreed with what was determined by the Iraqi standards for the

year 1988, as it stated that the percentage of moisture in soft cheese should not be less than 50%. These results are also consistent with the findings of (Grzanich et. al., 2017) regarding the proportion of protein in soybean cheese(15-19%) and the percentage of carbohydrates up to 4%.

Table (2) shows the percentage (%) of the chemical analysis of soy cheese and ginger-fortified cheese

Tests Transactions	Moisture	protein	lipid	ash	carbohydrate
Control	68.1	18.2	9.72	0.76	3.244
A1	67.4	18.3	9.72	1.31	3.249
A2	67.3	18.3	9.72	1.41	3.249

- The numbers in the table refer to three-repeat rates
- (A1) ginger concentration 0.2 g / 100 cheese) and (A2) = ginger concentration 0.4 g / 100 cheese.

When comparing the percentage of moisture in soybean cheese with soybean cheese fortified with ginger at a concentration of 0.2 and 0.4g / 100g soy cheese it is noted that all treatments using ginger and both concentrations decreased moisture from soy cheese (control treatment) that recorded the highest values Where it reached (68.1) and may be due to the high percentage of solid materials in dry ginger powder, which led to the absorption of moisture from cheese. It is also noticed that there is an increase in the percentage of protein fortified with ginger and both concentrations, and the reason may also be due to the slight increase in the percentage of protein in fortified cheese than soy cheese because the fortified cheese has a lower level of moisture than soy cheese, which leads to a high concentration of solids in the soy cheese fortified with ginger Including protein.

The results also showed an increase in the ash content of ginger-supported soybean cheese when compared to soybean cheese. Ginger-fortified cheese scored at a concentration of 0.4 g / 100 g soybean cheese with the highest ash value (1.431%). Perhaps the reason is due to the presence of mineral elements in ginger, as well as the effect of salts that reduce the level of moisture in cheese, which leads to a high percentage of total solids, including ash. This corresponds to the findings of the researchers (Aureli, *et al.*, 2000) in their study of a decrease in the moisture values of the two types of cheese compared to the two control factors, and this may be due to the addition of the initiator, which caused a decrease in the pH values, and notes that the percentages of the rest of the ingredients are protein, fat and ash A slight increase in their values compared to the two control treatments. This may be attributed to a decrease in the humidity due to a decrease in the pH values, which caused the exit of a greater amount of moisture with a whey.

Blood tests in the middle of the experiment and the end of the experiment

Estimate the results of blood glucose analysis

Table (3) shows the results of the analysis of glucose in the blood of rats, the results showed that there were significant decreases for all treatments at the end of the experiment when compared to the standard diet (negative control) as well as when compared to the middle of the experiment. Gram cheese (the lowest values were recorded) (62.83 Mg / dl) and the standard treatment recorded the highest values recorded (99.50Mg / dl). Perhaps the reason is due to the low presence of sugars in soybean cheese and medicinal plants, as well as the presence of a moderate proportion of fiber in soy cheese and medicinal plants Which have an important role in lowering blood glucose. The cause of low blood sugar is likely linked to the components of ginger, which are polyphenols and flavonoids, and this is consistent with what the researchers stated (Moradi-Podeh *et.al* ,2018) It also agrees with the findings of the two researchers (Shewita & Taha, 2018) in their research that the active compounds in ginger work to inhibit the hepatic enzyme phsphorylase, which works to demolish the collagen. Ginger improves the stimulation of glycogen-creating enzymes. The reason is also attributed to the decrease in the blood sugar level of rats fed to hashish because it contains polyphenols and citral compounds, and this corresponds to what the researchers said (Olorunnisola *et.al.*, 2014).

Table (3) Results and standard error for analyzing the level of glucose in the blood of rats in the middle and end of the experiment

Glucose Transactions	Middle of the experience	End of the experience
Negative control	99.5±1.87 a	99±1.87 a
Positive control	88±2.25 b	87.16±2.11 b
A1	73.73±1.9 cd	70.5±1.3 cd
A2	69.23±1.2 cd	62.83±1.1 c

- Differences in lowercase letters indicate a significant effect at ($P \leq 0.05$).

Analysis of cholesterol, triglycerides and lipoproteins in the blood of rats

Table (4) indicates the results of the statistical analysis of blood tests in the middle and end of the experiment for both cholesterol and triglycerides and low and high density lipoproteins (HDL, LDL, VLDL) in the blood of rats. The results showed that there were significant decreases at the level ($P \leq 0.05$). Both cholesterol, triglycerides and low-density lipoproteins for the treatments fed on soybean cheese fortified with ginger (A1, A2) compared to feeding on the standard diet (negative control) and (positive control) at the end of the experiment, as well as if significant declines were observed for the supported treatments at the end Experience when compared to the middle of the experiment.

Table (4) Results of statistical analysis overlap and standard error for cholesterol, triglycerides and lipoproteins in the middle and end of the experiment

Tests Transactions	cholesterol		Triglyceride		LDL		vLDL		HDL	
	Amid experi.	end of experi.	Amid experi.	end of experi.	Amid experi.	end of experi.	Amid experi.	end of experi.	Amid experi.	end of experi.
Negative control	b 150±2.3	b 155±2.1	b 60±2.8	b 65±2.3	b 75±1.2	b 80±1.1	ab 12±1.2	ab 13±1.2	ab 63±0.3	ab 62±0.25
Positive control	ba 190±2.1	a 201±2.2	a 70±2.1	a 72±2.5	a 122±1.1	a 135.6±1.2	a 14±1.1	a 14.4±1.1	b 54±0.2	b 51±0.2
A1	b 145±1.8	b 140±1.2	cb 55±1.3	cb 54±1.2	cb 68±1.0	cb 62.2±0.9	ba 11±1.0	ba 10.8±0.9	ab 66±0.23	ab 67±0.3
A2	bc 142±1.7	c 136±0.8	cb 52±1.1	c 50±1.0	cb 64.6±0.9	c 58±0.8	b 10.4±0.9	b 10±0.7	a 67±0.3	a 68±0.1

- Differences in lowercase letters indicate a significant effect at the ($P \leq 0.05$) level.

The results also showed significant decreases in the percentage of cholesterol and triglycerides and low-density proteins for the treatments that were supported by ginger and both concentrations. An increase in the rate of decrease was observed with an increase in the concentration of medicinal plants. In their composition, and this is agreed by the researchers (AL-Jawad *et.al.*, 2015) that soybean compounds reduce cholesterol, triglycerides and low-density lipoproteins, the most important of which are plant sterols, which are general steroid compounds that resemble cholesterol but differ. It is related to the side chains linked to the rings, and this similarity has an important role in the process of inhibiting the absorption of cholesterol, so the compounds have been used to reduce the level of cholesterol in the body. Perhaps the reason for the decrease is also due to active soy compounds such as Soy saponin and isoflavone, and both contain aglycoses and glycosides, which are soluble in alcohol that lowers cholesterol and saponins are an effective compound in lowering cholesterol. As it is one of the bindily bound compounds that bind bile acids to cholesterol and reduce its level in the blood as well as the unsaturated fatty acids that are free of cholesterol and this is what the researchers agree (Chatterjee *et.al.*, 2018).

The highest rise in HDL occurred in ginger fortified soybean cheese with the highest concentration (0.4 g), which recorded the highest values (86 mg / dl) compared to the rest of the treatments, perhaps due to the presence of antioxidants, poly phenol compounds and Tannins) and

volatile oils that work To stimulate digestive enzymes, this corresponds to the findings of researcher (Moradi-Podeh *et.al* ,. 2018).

Results of Creatinine and Urea Creatinine Analysis in Rat Blood

Table (5) indicates the results of the statistical analysis of creatinine and urea tests in the blood of rats, as well as the comparison of results between the mean and end of the experiment and the small letters indicate the presence of significant differences at the level of ($P \leq 0.05$). The results showed that the creatinin analysis at the end of the experiment showed a significant decrease in the coefficients (A1, A2) when compared with the negative and positive control and the treatment fed on ginger-supported soy was recorded at a concentration of (0.4 g / 100 g) (A2) (the lowest values were recorded) The positive control treatment recorded the highest values (0.72 Mg / dl) and the results showed a urea analysis at the end of the experiment about the presence of significant decreases of the coefficients (A1, A2) when compared with the negative and positive control and recorded the treatment that was fed to foul Ginger-backed soy with a concentration of (0.4 g / 100 g)(A2) the lowest values were recorded (28.33 Mg / dl) and the positive control treatment with hypercholesterolemia was recorded at the highest values (43.66 Mg / dl) and the results show that eating soybean cheese and the medicinal plants mentioned I positively affected college activity and work. Note that all the results were within the normal range of creatinine and urea presence in the blood and this corresponds to what the researcher reached (Ademuyiwa *et.al.*, 2017) .The researchers' findings (Ekpenyong *et al.*, 2014) also agree that phenolic compounds work to improve Liver and kidney tissue and lowering urea and creatinine in the blood.

Table (5) Results of statistical analysis and standard error of creatinine and urea level in the mean and end of the experiment

Tests Transactions	Creatinine		Urea	
	Mid of experiment	end of experiment	Mid of experiment	end of experiment
Negative control	b 0.65±0.001	b 0.66±0.001	b 36±1.7	b 38.33±1.8
Positive control	a 0.7±0.0001	a 0.72±0.0001	a 40±1.7	a 43.66±1.9
A1	b 0.6±0.001	b 0.59±0.001	cb 33±1.5	cb 31.33±1.4
A2	cb 0.56±0.0001	c 0.55±0.0001	cb 29±1.6	c 28.33±1.3

Results of the statistical analysis of liver enzyme tests in the blood of laboratory rats

Table (6) indicates the results of the statistical analysis of liver enzymes (AST, ALT, ALK) in the blood of rats at the end of the experiment, as well as the interference between the middle and end of the experiment. The differences in the small letters indicate the presence of significant differences at the level of ($P \leq 0.05$). On the presence of significant decreases in all liver enzymes at the end of the experiment (AST, ALT, ALK) for transactions (A1, A2) when compared to negative and positive control, as well as slight significant decreases were observed for all liver enzymes in the treatments of (A1 and A2) except for negative and positive control in The end of the experiment when compared to the middle of the experiment. This is in line with the researcher's findings, Al-Douri (2012) in his study on the role of ginger, which has a positive role in improving liver function and may be due to the presence of phenolic compounds, antioxidants, vitamin C and vitamin E, which improve blood circulation as well as improve the role of enzymes that Including liver enzymes. The findings of the researcher, Abdel Hassan (2015) in her study using the water aqueous ginger extract, which led to a significant decrease in liver enzymes.

Table (6) Statistical analysis and standard error of liver enzyme standards (AST, ALT, ALK) in the blood of laboratory rats in the middle and end of the experiment

Tests Transactions	AST		ALT		ALK	
	mid of experiment	end of experiment	mid of experiment	end of experiment	Mid of experiment	end of experiment
Negative control	b 104±0.8	b 105±0.8	b 31±2.1	a 34±1.9	b 216.6±2.2	b 218±2.1
Positive control	a 107±0.7	a 111±0.8	a 35±2.1	a 37±2.0	a 219±2.1	a 221±2.2
A1	bc 103±0.6	cb 100.33±0.7	cb 33.66±1.6	cb 32.66±1.5	cb 209±2.0	cb 206.6±1.7
A2	101 ed	c 99.55±0.4	cb 32.66±1.5	c 31±1.5	cb 208.3±1.9	c 206±1.5

- Differences in lowercase letters indicate a significant effect at the ($P \leq 0.05$) level.
- The lowercase letters also indicate the resultant overlap between the middle and the end of the experiment.

Histological examinations

Histological results of the kidney

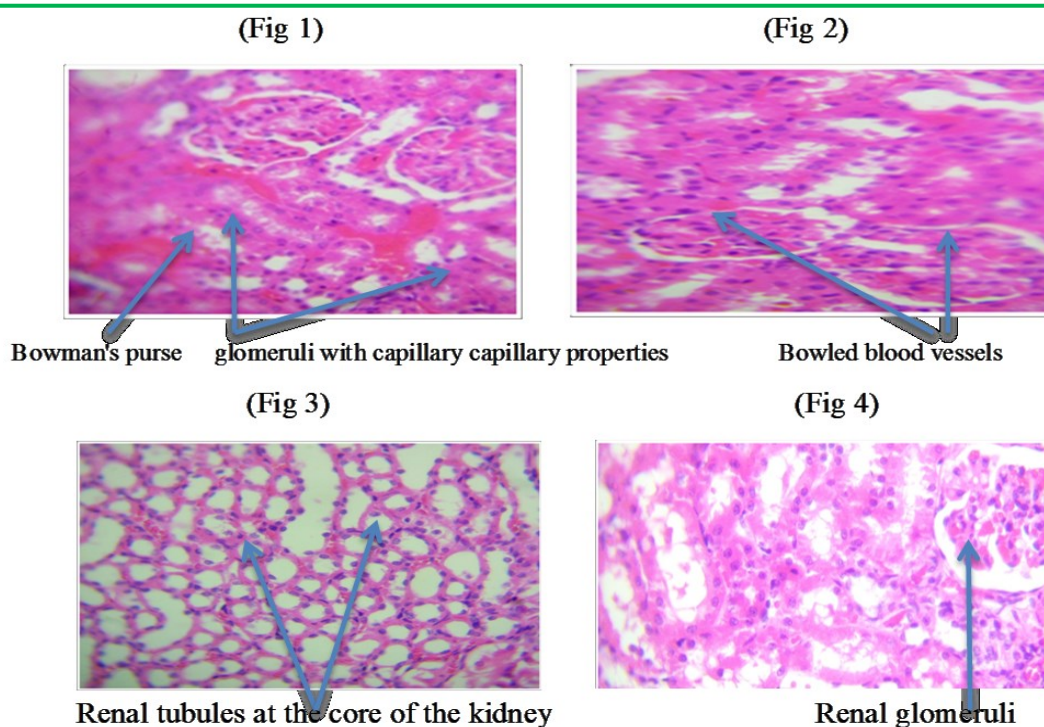
The results of the histological results of the kidney (Negative Control) showed the college cortex, which contained glomeruli with capillary capillaries in the Bowman's purse, where they appeared spherically and with little lobes, surrounded by the capsular space and Bowman's wallet, and around them large numbers of nearby twisted tubules with pyramidal cells pigmented red balloon and distal convoluted tubules with cavity wide cells, shown in (Figure 1)

The results of microscopic examination of the rat kidney tissue of negative control groups showed that the cortex of the kidney contains blood vessels congested around the renal glomeruli and the near and distal convoluted tubules shown in (Figure 2).

The results showed the microscopic examination of the rat kidney of the group of experimental animals fed on soy cheese supported with ginger concentration 0.2 (g / 100 g) The kidney pulp contained the renal tubules from the kidney pulp towards the nodule of the kidney and appeared with a natural structure and there are no abnormal changes shown in Figure 3.

The results showed microscopic examination of the rat kidney of the group of experimental animals fed on soy cheese supported by ginger concentration (0.4 g 100 / g) and the presence of lobular renal glomeruli in a partial manner and their total silt with the presence of limited glomerular leaky in some near and distant tubules and as it was observed the presence of lymphocytes stimulated to Composition of the defensive cells shown in Figure 4.

It can be seen from the results above that the kidney tissue showed an improvement in the overall structure of the kidney in general for all treatments compared to the treatment (positive control) and the reason for that may be due to the presence of antioxidants and phenolic compounds in soy cheese and ginger and the results are consistent with what the researcher reached AL-Amoudi (2018) in his study Ginger has a protective effect against tissue damage and biochemical toxicity resulting from the effect of the insecticide. The ginger extract also improved damage to the DNA and improved the tissue and function of the thyroid gland. The researcher indicated in his study about the role of ginger in the treatment of hyperemia and congestion of the blood vessels of rats.



Histological results of the liver

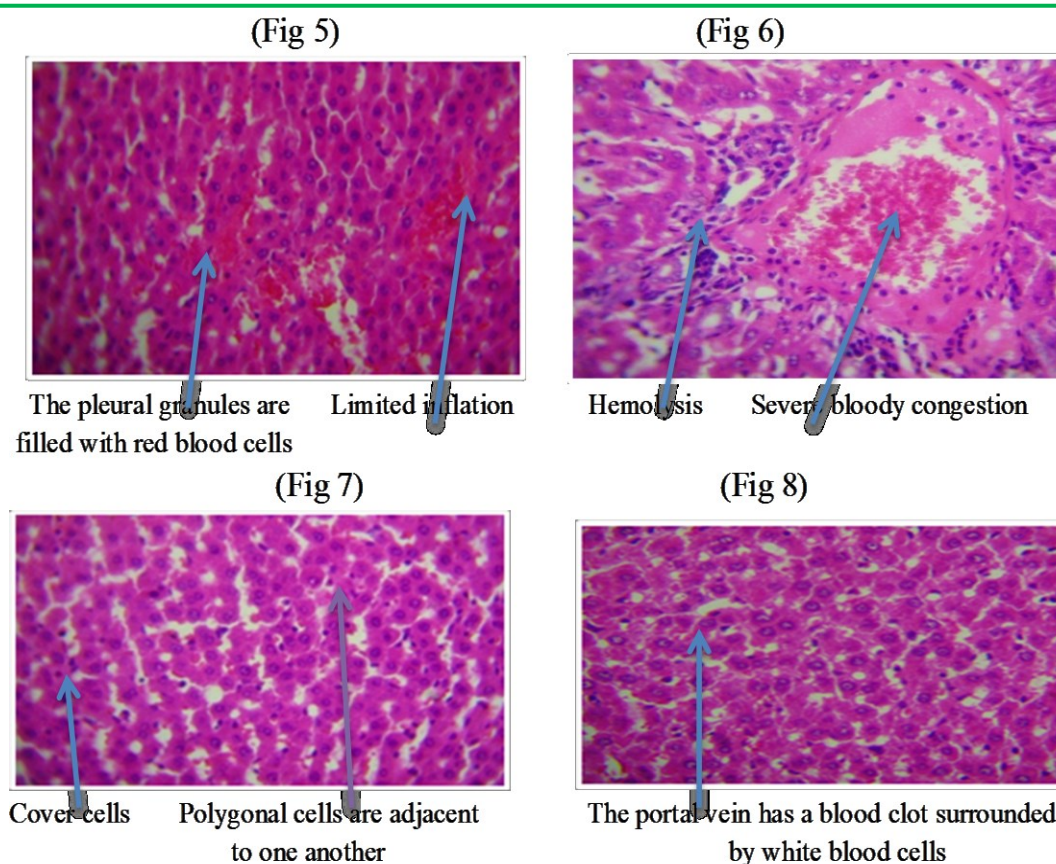
The results showed a histological examination of the liver of a negative control group (fed by the standard diet) some of the hepatocytes with limited enlargement with a dark pigment cytoplasm and a dark central coloring of the pigment with a blue color with hematopoietic fullness of red blood cells (Fig 5).

The results of microscopic examination of the liver tissue of the rat groups of positive control animals with hypercholesterolemia showed the appearance of severe blood congestion with lateral hemolysis in which lymphocyte cells leak around the blood vessels and the white blood cells are observed with sinusoids in the rows of hepatocytes (Fig. 6).

The results of histological examination of the liver of a rat group of rats fed on soybean cheese supported with ginger showed a concentration of (0.2 g / 100 g cheese A1) The portal area in the liver contained a branch of the portal vein and had a blood clot surrounded by inflammatory white blood cells with the white blood cells surrounding the channel The yellow shown in (Fig 7).

The results of histological examination of the liver of a rat group of rats fed on soybean cheese supported by ginger showed a concentration of 0.4 g / 100 g cheese (A2) Liver cells appeared in a polygonal shape adjacent to each other in the form of columns or long rows of dark spherical dye and those cells adjacent to the sinusoid The hematopoietic which has the Cover cells shown in (Fig 8).

It can be seen from the results above that the liver tissue showed a slight negative impact on the livers of rats in (positive control), where cases of hemorrhage and slight degeneration were observed in some liver cells, and the reason may be attributed to this to feed the rats in this treatment on a diet rich in fats throughout the trial period that led to a rise The level of cholesterol and triglycerides in the blood of rats and the low presence of antioxidants, which increases the exposure of rats to oxidative stress. These results were consistent with the findings of the researcher Hassan (2018). The tissue tests of the livers of rats fed on soybean cheese supported with ginger And liver cells, the reason may be attributed to the presence of antioxidants and phenolic compounds in soy cheese and ginger that accelerate the cellular repair process and stimulate tissue cells to secrete chemical attraction factors to attract inflammatory cells, and this corresponds to what the researcher reached (Al-Douri, 2012).



Sensory evaluation of soybean cheese fortified with medicinal plants (ginger) with a concentration of 0.2 and 0.4 g / 100 g cheese:

Table (7) shows the results of the sensory evaluation of processed and soybean cheese with medicinal plants (ginger) concentration 0.2 and 0.4 g / 100 g cheese after one day cheese process and the results showed the sensory evaluation grades of the soybean cheese fortified with ginger with cherry 0.4 g / 100 g Cheese has the highest degree of sensory evaluation, while the results of the unsupported soy cheese recorded the lowest levels of sensory evaluation, and the reason may be attributed to that due to the role of effective flavor compounds found in ginger and these results are consistent with what the researchers reached (Asem *et al.*, 2009), where they found that the cheese added to ginger Score the best results for most arbitrators.

Table (7) Sensory evaluation of soybean cheese fortified with medicinal plants (ginger)

Transacti ons	Taste 20	Flavor 20	Composition 20	Texture and textures 20	Appearance 10	Color 10	Total 100
Control	10	11	14	15	7	7	64
A1	12	14	14	14	7	7	68
A2	13	15	15	14	7	7	71

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تحديد فاعلية جبن التوفو المدعم بالنباتات الطبية في مرتسم دهون الدم للجرذان المختبرية

علي حسين رشيد الراوي¹ وغزوان مهدي صالح²

1-وزارة الزراعة/مديرية زراعة نينوى 2-كلية الزراعة /جامعة تكريت/قسم علوم الاغذية

المستخلص

اجريت الدراسة الكيموحيوية في مختبرات جامعة تكريت كلية الزراعة للفترة من 2019/9/1 ولغاية 2019/11/1 تضمنت الدراسة تصنيع جبن من فول الصويا بطريقة التجبن الحامضي وتم تدعيم الجبن بإضافة نبات الزنجبيل الجاف بتركيز 0.2 و 0.4 غم 100\ غم جبن فول الصويا وتم إجراء الفحوصات الكيميائية للجبن و الكيموحيوية للجرذان وتم اخذ فحوصات الدم في وسط ونهاية التجربة، أظهرت نتائج التحليل الكيمياوي لجبن فول الصويا المصنع انخفاض في نسبة الرطوبة وارتفاع في نسبة البروتين والرماد في المعاملات التي تم تدعيمها بالزنجبيل. كما أظهرت نتائج التقييم الحسي تفوق جبن فول الصويا المدعم بالزنجبيل تركيز 0.4 غم 100\ غم جبن مقارنة مع باقي المعاملات. بينت نتائج الدراسة الكيموحيوية التي أجريت على الجرذان وجود انخفاض معنوي عند مستوى ($p \leq 0.05$) في مستوى الكوليسترول والكلوكوز والدهون الثلاثية والبروتينات الدهنية واطئة الكثافة ونسبة اليوريا والكرياتين للمعاملتين التي تم تدعيمها بالزنجبيل مقارنة مع السيطرة السالبة والموجبة. كما أظهرت نتائج التشريح النسيجي للكبد والكلى تفوق المعاملات التي تم تدعيمها بالزنجبيل مقارنة مع معاملي السيطرة السالبة والموجبة حيث لوحظ تحسن واضح في انسجة الكبد والكلى وظهورهما بالشكل الطبيعي. وبناءً على ذلك هدفت الدراسة الى تصنيع جبن (التوفو) ودراسة تأثير التغذية بجبن فول الصويا والمدعم بتركيز مختلفة من نبات الزنجبيل في الصفات الكيموحيوية لدم الجرذان ومتابعة الفحوصات النسيجية للكلى والكبد.

الكلمات المفتاحية: فول الصويا، جبن فول الصويا (التوفو)، نبات الزنجبيل، الكلوكوز، الكليسيريدات الثلاثية، انزيمات الكبد، انسجة الكلية والكبد.