JHE
JOURNAL OF HOME ECONOMICS, MENOUFIA UNIVERSITY
Website: https://mkas.journals.ekb.eg
Print ISSN 2735-5934 Online ISSN 2735-590X
NUTRITION AND FOOD SCIENCES

A comparative Study of the Influences of Several Varieties of Apple and Lupin Peels on Weight Loss in Obese Rats

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Article Type
Original Article

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DOI:10.21608/mkas.2023.236505.1254
Cite as:
Shahin et al., 2024, A comparative Study of the Influences of Several Varieties of Apple and Lupin Peels on Weight Loss in Obese Rats. JHE, 34 (1), 51-64
Received: 14 Sep 2023
Accepted: 31 Oct 2023
Published: 1 Jan 2024

ABSTRACT:
The objective of this research is to find out how the peels of several varieties of apple (red, green, and yellow) and lupin (sweet and bitter) peels are effective at reducing obesity in overweight rats. Thirty-five male albino rats were used in this study, and weighting (200-210g) was divided into seven groups, five rats each. To induce the obese rats, a diet rich in lipids (20% animal fats) was once given to them. Additionally, lipid fractions such as total cholesterol, triglycerides, high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein, as well as renal biomarkers (urea, uric acid, and creatinine) and liver enzymes (alanine aminotransferase, aspartate aminotransferase & alkaline phosphatase), were measured in the study. The findings confirmed that the obese positive group that used to be obese had considerably reduced renal and liver functioning (P≤0.05). With significant variances, apple and lupin peels groups had the lowest total cholesterol, triglycerides, high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein readings, with increased high-density lipoprotein cholesterol ranges. In conclusion, obese rats given powdered apple and lupine peel versions demonstrated a considerable increase in blood lipid fractions, liver enzymes, and renal biomarkers. Along with the various health advantages, these peels can be used in our regular and a variety of meal products.

Keywords: *Fruit peels, lupin, Rats, weight loss*

INTRODUCTION

Obesity is a clinical disorder when body fats build up to a specific extent. These outcomes may additionally be hazardous to the body, affecting lifestyles expectancy and fitness conditions [1]. Consuming too a lot in junk food and drinks with excessive degrees of saturated fat and simple carbohydrates, which represent the Western diet, is partly responsible for weight problems and obese people [2]. Also, body mass index [BMI] measures obesity as weight in kilograms [kg] over height in meters squared [m2]. In medical trials, fats mass, waist and hip diameter, and BMI are typically used to verify overweight. [3]. It is brought on through changes in the

body's energy balance, which leads to a slower metabolic rate from foods that are ingested in extra of what the body clearly requires [4].

The 4th most produced fruit globally is the apple [Malus domestica), a rose (Rosaceae) family plant. It is a delectable fruit [5]. Among the many popular fruits is the apple. They have a low-calorie content, which is advantageous for preventing metabolic syndrome through diet. Apples are heavy in carbohydrates and low in protein and fat. It is a provider of biologically active substances and dietary fiber. like anthocyanidins and flavanols [6]. Apple peels may additionally operate as an important food in the fight against weight problems due to the fact it's a considerable providing of antioxidants and fiber [7]. Supplementing with quercetin, an antioxidant, additionally enhanced the lipid fractions by way of reducing ranges of TC and LDL-c, for instance. Additionally, Apple peels decreased amount of oxidative LDL, an established risk indicator for atherosclerotic [8]. Consumption apples and apple peels can decrease blood lipid ratio that is TC, TG, and LDL-c, which lowers the possibility of cardiovascular disorder [9].

Together with grains, legumes which important supply of plant proteins in each day meals of people. Additionally, they are generally excessive in carbohydrates and dietary fibres [10]. Lupine (Lupinus albus), a belonging of the Fabaceae family of plants, can be found not only in North Africa but also along the Nile River and across the Mediterranean Sea region. We can find many nutrients in lupine seeds like copper, phosphorus, calcium, and manganese as well as proteins, lipids, fatty and, amino acids, and carbs. The plant additionally consists of various ranges of vitamins C, E, thiamin, riboflavin, and niacin [11]. Lupin and other legumes are rich in dietary fiber, healthful fats, flavones, and antioxidants, which might also assist lower cholesterol and lower the risk of cardiovascular disease. Additionally, they incorporate a lot of saponins and phytosterols, which can also help minimize the quantity of cholesterol absorbed from the gut. [12]. The addition, a few diets containing more than 25 g of lupine reduce total LDL-c and VLDL, as properly as triglycerides, in hypercholesterolemic patients, in accordance with various medical human investigations [13].

The purpose of the research was once to find out the effects of various amounts of powdered apple and lupine peels on the biological assessments of rats suffering from obesity.

MATERIALS AND METHODS

MATERIALS:

Apple fruit and lupin were bought at a nearby market, Alexandria City, Egypt.

Experimental rats

An overall of 35 mature male white Sprague Dawley rats, ranging 200-210g each, was once received from Medical Insects Research Institute, Cairo, Egypt.

Diet supplements

We bought diet supplements that are casein, cellulose, choline chloride, and DL-methionine from Morgan Company. Egypt.

Chemical kits

Al-Gomhoria Co. for Trading in Chemical, Drug, and Medical Equipment, Cairo, Egypt, supplied the chemical kits that were used to determine the lipid fractions, renal biomarkers, and liver activity.

METHODS

The preparations of apple fruit and lupin peels

To get the apple fruit and lupin peels were acquired from a nearby market, apples rinsed by water to remove dusts then samples were peeled using a knife, dried by air oven, after being provided in powder form, the ingredients undergo grinding with an air-powered grinder by a blender with a rapid speed (Broun, made in Germany), packed in black glass containers, then stored in an extremely cold freezing at -18 °C for additional processing.

The induction of obesity

To cause obesity in commonly healthful male rats, the everyday diet was once supplemented with high-fat meals that contained 20% fats from animals (14).

Test approach

The Science Research Ethics Committee of the Faculty of Home Economics, Menoufia University accepted the research protocol (#11-SREC-10-2020).

In this experiment, 35 adult male white rats, 12 weeks old, ranging (200±10g), was employed. For adaptation, all rats received regular diet (casein diet) for one week according to Reeves et al., (15). Following this phase of adjusting, animals had split into seven groups, every one contains 5rats the following: Group (1): Rats have been given a regular diet, serving a control negative group. Group (2) Rats that are obese have been given a regular diet, serving as control positive group. Group (3): Rats that are obese have been given a regular diet, with approximately 10% lupin peel powder of the weight of diets. Group (4): Rats that are obese have been given a regular diet, with approximately 10% lupin peel powder of the weight of diets. Group (5): Rats that are obese have been given a regular diet, with approximately 10% red apple peels powder of the weight of diets. Group (6): Rats that are obese have been given a regular diet, with approximately 10 % yellow apple peels powder of the weight of diets. Group (7): Rats that are obese have been given a regular diet, with approximately 10 % green apple peels powder of the weight of diets.

It took place over the course of twenty-eight days in the test investigation. At the finish of the test, every rat is individually weighed before being slaughtered and getting samples of blood taken.

Collection of blood

Rats were slaughtered at the finish of the research following a 12-hour fast. Dry,

sterile centrifuge tubes have been used to gather blood samples from a portal vein. To get the serum, the samples have been centrifuged at 4000 rpm for 10 minutes. The serum was once saved at -20°C for analysis according to the method of (16).

Biochemical analysis

Feed intake, feed efficiency ratio, and percentage of body weight have been calculated in accordance with (17). Total cholesterol was calculated using the (18) technique. Triglycerides were carried out using the techniques mentioned in (19 and 20). The levels of HDL-C levels were calculated with the technique of (21 and 22). The following equation was used to determine both VLDL-c and LDL-c as follows: VLDL-c = (Triglycerides/5).

LDL-C = (T. C. - HDL-C) – VLDL-C (23).

Alkaline phosphatase (ALP) concentration was estimated by using the method of (24), alanine amino transferase (ALT) levels were estimated by using the method of (25), and aspartate amino transferase (AST) levels were estimated by using the method of (26). While serum creatinine, urea, and uric acid were calculated by using the method of (27, 28 and, 29).

Statistical evaluation

A significant primary factor used to be located, the records have been examined the use of a thoroughly randomized factorial design, and the ability have been separated the use of known as the Student-Newman-Keuls test. The Costat Program has decided that variations between remedies that are ($P \leq 0.05$) significant. To consider the biological outcomes, one way ANOVA was once at first used (30).

Results and Discussion

Table (1) of data displayed the average values of FI, FER, and BWG% of overweight rats given therapy several varieties of apple and lupin peels at different levels. This table indicates that mean values of BWG which were significantly between two control groups. The corresponding averages have been 6.61 and 2.76 %. Regarding overweight rats, the maximum BWG recorded with 10% red apple peels while the smallest BWG recorded with10% sweet lupin peels showing significant difference between them. The average reading was 5.48 and 4.58 %, respectively.

As for feed intake (FI), data indicates that mean values of FI of positive and negative control observed significant differences which were 17.62 and 16.75 g/day, respectively. Regarding overweight rats, the maximum FI recorded with 10% red apple peels while the smallest FI recorded with 10% bitter lupin peels showing significant difference. The average reading was 18.49 and 17.47, respectively.

The negative control group, however, displayed a greater feed efficiency ratio (FER) in contrast to the group with control positive having a considerable distinction. The average reading was 0.052 and 0.040 %. While overweight rats, the maximum

level recorded with 10% red and yellow apple peels, while the lowest one recorded with 10% sweet lupin peels, which were 0.051 and 0.034%, respectively. These outcomes are constant with those of (31) who suggested that obese female rats fed a powdered formula of the herbs and plants under consideration at a dosage of 10% should lose weight and enhance various indices.

A great decline in weight growth used to be additionally viewed in mice given a diet rich in fats which included 5% and 10% of bitter lupin, along with 10% of chickpea (32).

Table (1): Influence of various apple and lupin peel kinds on the body weight gain, food intake, and feed efficiency ratio of obese rats

Treatments / Groups	BWG (%)	FI (g)/day	FER (%)
Group (1): Negative control	2.76d±0.69	17.62c±1.41	0.052a±0.03
Group (2): Positive control	6.61a±0.03	16.75d±0.62	0.040b±0.01
Group (3): Obese rats+ 10% sweet lupin peels	4.58b±0.15	17.75b±0.29	0.034c±0.01
Group (4): Obese rats+ 10% bitter lupin peels	5.21b±0.74	17.47c±1.99	0.043b±0.03
Group (5): Obese rats +10%red apple peels	5.48ab±0.82	18.49a±1.33	0.051a±0.02
Group (6): Obese rats+ 10%green apple peels	5.01c±0.56	18.42a±1.15	0.047b±0.01
Group (7): Obese rats + 10%yellow apple peels	4.63 c±0.32	18.09ab±1.02	0.051a±0.04

Statistics are expressed as averages SD, with values in related columns. They differ significantly when different superscript letters are used (P≤ 0.05).

Table (2) displays the influences of several varieties of powdered apple and lupin peel kinds on the blood triglycerides and total cholesterol ranges in rats suffering from obesity. The collected results showed that, with significant differences (P≤0.05), the serum triglyceride levels in the group with control positive were the most elevated and that in group with control negative showed least, respectively. These values were 140.71 and 63.87 mg/dl. On the contrary hand, groups suffering from obesity, 10% peeling of yellow apple was the greatest blood triglycerides rates, and 10% peeling of red apple was the smallest, with notable variations. The corresponding average was 112.44 and 95.52 mg/dl.

Serum total cholesterol ranges confirmed a noteworthy difference among the group with two controls. The corresponding mean values have been 172.18 and 94.79 mg/dl. The most blood total cholesterol ranges in overweight groups, however, were in 10% yellow apple peels, whilst smallest ranges had been in 10% red apple peels. These variations had been significant (P≤0.05), achieving 150.84 and 125.14 mg/dl. The findings are consistent with the results of (33) claimed to have researched the beneficial roles of lupin and way of life changes in the administration of metabolic syndrome

and located that combining lupine administration with life-style changes is a fantastic intervention for each the prevention and therapy of metabolic syndrome. Additionally, dietary propionate has been observed to decrease serum whole cholesterol. Furthermore, due to the fact apple peeling is a significant source of fiber, and supply antioxidants, they may additionally have a role in participating in the fight against overweight and metabolic disorder (34).

Table (2): Influence of several varieties of apple and lupin peels on serum triglycerides and total cholesterol of obese rats

Parameters / Groups	Triglycerides (mg/dl)	Total cholesterol (mg/dl)
Group (1): Negative control	63.87e±5.11	94.79f±3.36
Group (2): Positive control	140.71a±3.43	172.18a±5.81
Group (3): Obese rats+ 10% sweet lupin peels	109.57b±2.18	143.13c±3.19
Group (4): Obese rats+ 10% bitter lupin peels	96.97c±1.79	131.53d±2.37
Group (5): Obese rats+ 10% red apple peels	95.52d±4.15	125.14e±1.74
Group (6): Obese rats+ 10 % green apple peels	103.82b±3.19	135.11d±2.33
Group (7): Obese rats+ 10% yellow apple peels	112.44b±6.53	150.84b±5.16

Statistics are expressed as averages SD, with values in related columns. They differ significantly when different superscript letters are used (P≤ 0.05).

The influence of several varieties of apple and lupin peels on the lipid fraction like HDL-C, LDL-C, and VLDL-C in rats suffering from obesity are shown in Table (3). The information gathered confirmed that, with major variations (P≤0.05), the group with control negative had the maximum amount of HDL-c and the group with control positive had the least amount. There had been 46.94 and 28.46 mg/dl on average. On the other hand, in obese groups, 10 % sweet lupin peels had the lowest amounts of high-density lipoprotein cholesterol, whereas 10% red apple peeling had largest amounts. The versions had been considerable (P≤0.05), and their respective values had been 35.90 and 40.41 mg/dl.

The group with control positive had the most elevated amounts of LDL-c, while the group with control negative had the smallest amounts, with significant variations (P≤0.05). The average LDL-c concentrations were 115.58 and 35.08 mg/dl, respectively. However, in obese groups, 10 % yellow apple peeling resulted in the most elevated amounts of LDL-c, whereas 10 % red apple peeling resulted in the smallest levels, with significant differences (P≤0.05). There were 90.39 and 65.63 mg/dl on average, respectively. The most extremely VLDL-c

amounts had been observed in the group with control positive, whereas the smallest amounts had been in the group with control negative, with considerable variations (P≤0.05). Both average readings have been 28.14 and 12.77 mg/dl. The most VLDL-c amounts of the overweight groups have been discovered in the 10 % yellow apple peeling group, even as the smallest amounts had been observed in the 10 % red apple peeling group. The variants have been considerable (P≤0.05), and they reached 42.49 and 19.10 mg/dl. These consequences are in line with those of (35) discovered that only rats given a diet excessive in cholesterol confirmed a significant impact of apple peels and pulp on plasma lipid composition, as evidenced by using a drop of TC and LDL-cholesterol fraction concentrations. For dietary prevention of atherosclerosis and different diseases, apples peels are favored due to their excessive level of biologically active substances.

Furthermore, Sirtori et al., (36) demonstrated that the quantities of total plasma and VLDL-cholesterol in rats may want to be reduced through lupin protein isolates. According to in vitro experiments, this influence used to be related to the activation of low-density lipoprotein receptors using specific protein compounds observed inside lupin seeds.

The meals are natural, organic, and nutritious for each the bitter and sweet lupin seeds, that are appropriate for reducing oxidative stress, hyperlipidemia, hyper-triglyceridemic syndrome, and hypercholesterolemia. When in contrast to the use of high cholesterol medicines, these consequences are obviously different, which may have fatal adverse results such skeletal muscular pain or weakening (37).

Table (3): Influence of several varieties of apple and lupin peels on lipid fraction of rats suffering from obesity

Parameter / Groups	HDL-c (mg/dl)	LDL-c (mg/dl)	VLDL-c (mg/dl)
Group (1): Negative control	46.94a ± 1.25	35.08e± 2.13	12.77d± 0.69
Group (2): Positive control	28.46e ± 1.46	115.58a± 4.58	28.14a±1.20
Group (3): Obese rats+ 10% sweet lupin peels	35.90c±0.14	85.32b± 4.11	21.91b ±1.72
Group (4): Obese rats+ 10% bitter lupin peels	40.21b ±0.11	71.93c±3.53	19.39c± 0.10
Group (5): Obese rats+ 10% red apple peels	40.41b ±0.75	65.63d±3.70	19.10c±2.20
Group (6): Obese rats+ 10% green apple peels	37.69bc ±1.36	76.66d±3.10	20.76b ±1.72
Group (7): Obese rats+ 10% yellow apple peels	37.96bc ±1.55	90.39d±4.50	22.49b ±1.72

Statistics are expressed as averages SD, with values in related columns. They differ significantly when different superscript letters are used (P≤ 0.05). HDL-c= High density lipoprotein cholesterol. LDL-c =Low density lipoprotein cholesterol. VLDL-c = Very low-density lipoprotein cholesterol.

Table 4 shows how several varieties of apple and lupin peel powders affected the liver enzyme values like ALT, AST, and ALP in rats suffering obesity. The average

values for two groups control (positive and negative) have been 83.48 and 53.67 U/L, respectively, making it clear that the group with control negative had the maximum ALT liver enzyme ranges, and the group with control positive had the smallest. These variations have been significant. Although there were substantial variances (P≤0.05), 10% bitter lupin peels had been related with the maximum ALT liver biomarker in the obese groups that received therapy, whereas 10 % peeling of yellow apple was related with the lowest value; the average values had been 38.71 and 35.06 U/L, respectively.

The group with control positive had the maximum ranges of the AST liver enzyme, whilst group with control negative had the smallest, with substantial versions (P≤0.05), corresponding to 52.36 and 31.31 U/L. But on another side, with statistically substantial variations, 10% bitter lupin peels had the highest AST liver enzyme amongst treated groups (obese groups), and 10% peeling of green apple was the lowest value. These values had been 43.22 and 36.47 U/L, respectively.

The group with control positive had the maximum ranges of the ALP liver biomarker, whilst group with control negative had the smallest, with substantial versions (P≤0.05), corresponding to 109.68 and 86.10 U/L. But at another side, with statistically significant variations (P≤0.05), 10% bitter lupin peels had the maximum ALP liver biomarker in the obese groups that received therapy, and 10% peeling of green apple was the smallest value. These values had been 145.30 and 96.80 U/L. This information is consistent with EL-Sayed (38), stated that rats receiving apple peel significantly decreased the liver enzymes like AST, ALT, ALP level in contrasting a blood sample to group with control positive.

In addition, as evaluation to the group with control positive, all treated groups given lupines, fenugreek, and bean that ate up 15% and 25% significantly reduced their serum levels of the liver enzymes GOT and GPT (39).

Table (4) The influence of several varieties of apple and lupin peels on liver activities of rats suffering from obesity

Parameters / Groups	ALT (U/L)	AST (U/L)	ALP (U/L)
Group (1): Negative control	53.67b±3.18	31.31d±1.01	86.10f±2.23
Group (2): Positive control	83.48a±2.23	52.36a±3.07	169.68a±5.26
Group (3): Obese rats+ 10% sweet lupin peels	38.11c±2.53	37.99c±1.75	114.70d±4.61
Group (4): Obese rats+ 10% bitter lupin peels	38.71c±1.16	43.22b±2.12	145.30b±3.13
Group (5): Obese rats+ 10% red apple peels	38.34c±1.83	40.27d±1.52	115.90d±2.41
Group (6): Obese rats+ 10% green apple peels	35.48d±1.37	36.47c±0.17	96.80e±1.75
Group (7): Obese rats+ 10%yellow apple peels	35.06d±1.15	41.73b±1.44	134.30c±3.14

Statistics are expressed as averages SD, with values in related columns. They differ significantly when different superscript letters are used (P≤ 0.05). ALT = Alanine amino transferase. AST= Aspartate amino transferase. ALP= Alkaline phosphatase.

Table (5) shows the influence of several types of apple and lupin peel powders on the concentrations of blood urea, uric acid, and creatinine in rats suffering from obesity. The gathered consequences confirmed that, with considerable variants (P≤0.05), the urea concentrations of the positive control group had been much larger and these of the group with control negative have been less. The average consequences had been 56.08 and 33.06 milligrams per deciliter. The maximum concentrations of the overweight groups had been discovered for 10% sweet lupin peels, though the smallest amount used to be located for 10% peeling of yellow apples, with readings of 44.44 and 37.17 mg/dl. These considerable variants (P≤0.05) have been observed between the two groups.

The gathered records confirmed that, with considerable variations (P≤0.05), the uric acid concentrations of the group with control positive were the most elevated and the group with control negative had the smallest ranges. These values had been 3.65 and 1.41 mg/dl. But amongst the overweight groups, 10% red apple peels had the biggest amount of blood uric acid ranges, though 10% yellow apple peels had the least amount, with considerably different values (P≤0.05), 2.69 and 2.16 mg/dl, respectively.

The data received proven that the group with control positive had the most elevated creatinine ranging even with the group with control negative had the least amount, with a considerable distinction (P≤0.05), between the two groups. The average concentrations have been 0.52 and 1.36 mg/dl. The maximum creatinine ranges had been discovered in 10% red apple peels, though the smallest amounts had been discovered in 10% yellow apple peels, with a considerable difference (P≤0.05), in the obese groups. The concentrations had been 0.85 and 0.67 mg/dl on average. These outcomes are consistent with those made by Norren et al., (40), who concluded that this flavonoid combination derived from apple peel dramatically reduced plasma creatinine and urea levels in vivo, each of which indicated enhanced preoperative renal function.

Additionally, consuming dried fruit peels had good therapeutic advantages towards lead toxicity and enhanced serum renal markers. The grouping fed a diet that included a 15% combination of dried fruit peels compared with the different group in terms of results (41).

Likewise, lambs given lupin seeds had significantly decrease serum urea-nitrogen ranges than lambs fed the control diet. However, lambs' serum urea-nitrogen levels seemed to drop when fed lupin. These variations, however, were no longer noteworthy. Additionally, data indicates that feeding lupin seeds had a negligible effect on renal function (42).

Table (5): Influence of several varieties of apple and lupin peels on renal biomarkers of rats suffering from obesity

Parameters / Groups	Urea mg/dl	Uric acid mg/dl	Creatinine mg/dl
Group (1): Negative control	33.06d ± 1.10	1.41e± 0.16	0.52d±0.01
Group (2): Positive control	56.08a ±4.18	3.65a ± 0.53	1.36a±0.46
Group (3): Obese rats 10% sweet lupin peels	44.44b± 3.65	2.63b ± 0.81	0.82b±0.15
Group (4): Obese rats + 10% bitter lupin peels	39.21bc±3.96	2.41c± 0.11	0.76bc±0.63
Group (5): Obese rats + 10%red apple peels	42.07b± 3.38	2.69b± 0.18	0.85b±0.71
Group (6): Obese rats + 10%green apple peels	39.81bc±2.77	2.34c± 0.24	0.81b±0.11
Group (7): Obese rats + 10%yellow apple peels	37.17c±1.25	2.16d± 0.13	0.67c±0.01

Statistics are expressed as averages SD, with values in related columns. They differ significantly when different superscript letters are used (P≤ 0.05).

CONCLUSION

Obese rats were given several varieties of apples and lupin peel powder, which enhanced lipid fractions, glucose ranges, liver activities, and renal biomarkers. Apples and lupin peels contain a high level of fiber and antioxidants, which are thought to protect and reduce obesity.

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الترقيم الدولي اون لاين 2735-590X الترقيم الدولي للطباعة 2735-5934

التغذية وعلوم الاطعمة

دراسة مقارنة لتأثيرات عدة أصناف من قشر التفاح والترمس على خفض الوزن في الفئران البدينة

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DOI:10.21608/mkas.2023.235711.1253

:الاستشهاد الي:

Shahin et al., 2024, A comparative Study of the Influences of Several Varieties of Apple and Lupin Peels on Weight Loss in Obese Rats. JHE, 34 (1), 51-64

:**تاريخ الاستلام: ١١ سبتمبر ٢٠٢٣**

:**تاريخ القبول: ٢٠ ديسمبر، ٢٠٢٣**

تاريخ النشر: ١ يناير ٢٠٢٤

الملخص العربى:

الهدف من هذا البحث هو معرفة مدى فعالية قشور أصناف التفاح المختلفة (الأحمر والأخضر والأصفر) وأصناف الترمس (الحلو والمر) فى تقليل السمنة لدى الفئران ذات الوزن الزائد. تم استخدام سبع مجموعات كل منها خمسة فئران ذكور ألبينو، وزن كل منها ٢٠٠-٢١٠ جرام، من أجمالى ٣٥ فأرًا. تلقت الفئران نظامًا غذائيًا غنيًا بالدهون (٢٠٪ دهون حيوانية) لجعلها تعانى من السمنة. بالإضافة إلى ذلك، تم قياس صورة دهون الدم مثل الكوليسترول الكلى، والدهون الثلاثية، والبروتين الدهنى عالى الكثافة، والبروتين الدهنى منخفض الكثافة، والبروتين الدهنى منخفض الكثافة جدًا، بالإضافة إلى المؤشرات الحيوية للكلى (اليوريا وحمض اليوريك، والكرياتينين) وأنزيمات الكبد (ألانين أمينو ترانسفيراز وأسبارتات أمينو ترانسفيراز وألكالين فوسفاتيز). اظهرت النتائج أن المجموعة التى تعانى من زيادة الوزن قد انخفضت وظائف الكبد والكلى بشكل كبير مع وجود فروق معنوية، سجلت مجاميع الفئران التى تغذت على قشور التفاح والترمس على أدنى مستويات الكوليسترول الكلى، والدهون الثلاثية، والبروتين الدهنى منخفض الكثافة، والبروتين الدهنى منخفض الكثافة جدًا، والعكس صحيح مع البروتين الدهنى عالى الكثافة. الخلاصة، الفئران البدينة التى تغذت على قشور التفاح والترمس المجفف اظهرت تحسن ملحوظ فى صورة دهون الدم ووظائف الكبد والكلى، بالإضافة إلى فوائده الصحية العديدة، يمكن استخدام هذه القشور في منتجاتنا الغذائية العادية والمتنوعة.

الكلمات الكاشفة: قشور الفاكهة، الترمس، الفئران، خفض الوزن