Author Gate

Journal of Medicine and Health Studies

Shaqra University

Original Article

The effect of some herbs and plants found in the Al-Baha region in reducing weight in obese rats

Lobna Abd Elmeged

Department of Home Economics-Nutrition, Faculty of Science and Art at Al-Makhwah, Al-Baha University, Saudi Arabia

CORRESPONDING AUTHOR

Lobna Abd Elmaged
Department of Home Economics-Nutrition, Faculty of Science and Art at Al-Makhwah, Al-Baha University, Saudi Arabia.
Email: lobna_lolo_2007@yahoo.com

https://orcid.org/0000-0003-1527-9457

Received: 09 May 2022
Accepted: 01 May 2023
Published: 30 June 2023

DOI
10.37881/jmahs.212

ABSTRACT

Background: Worldwide, obesity is becoming a serious issue for many nations. Over the past ten years, obesity has become more prevalent on a global scale. Fruits, flowers, leaves, peels, roots, or combinations of these plant parts are nowadays used by humans to reduce weight.

Aim: The purpose of this inquiry was to examine the impact of different vegetable peels and herbs found in the Al-Baha region used in weight-reduction formulations in obese rats.

Methods: The three plant peels and two herbs on a base diet were employed in various quantities in the mixture evaluated in 40 (Sprague-Dawley) white female albino rats weighed (175 5 g). Before the trial, all rats received a week of a regular diet for acclimatization. The rats were split up into (8) groups of five rats each, all of which had roughly the same overall weight. Except for one group providing a high-fat diet as a control group, all obese rats were fed a basal diet along with a formula containing researched vegetable peels and herbs for four weeks.

Results: There are no substantial difference exists between groups 1, 2, 5, and the control group. The seventh group was the lowest one in feed intake. There are no significant differences between groups 1,5 and 6. The lowest group in body weight gain was the last group which recorded 0.52 ± 0.16 g/ day. Between groups 2, 3, and 4, as well as between groups 2, 3, and 4, there are no notable differences (1 and 6). Meanwhile, rats fed in group 7 showed a significant decrease compared to control rats which were 0.055 ± 0.007.

Conclusion: The study recommended that nutrition and health education programs should be organized and directed for the public to important the peels of watermelon, peas, and eggplant for health and use in the technology field.

Keywords: Obesity, *Citrullus lanatus, Solatium melongena, Pisum sativum*

INTRODUCTION

The different parts of plants, including fruits, flowers, leaves, peels, and roots, or combinations of them, were employed as medications or treatments for various maladies, which varied the value of medicinal plants and herbs. Obesity is a disease characterized by excess body fat and a body mass index (BMI) of more than thirty, as obesity increases the risk of developing certain diseases and other health problems.[1] The most common risks that may result from obesity are high blood pressure, gallbladder disease, heart disease, diabetes, high cholesterol, strokes, osteoarthritis, venous disease, liver disease, acid reflux

disease, sleep apnea, respiratory diseases, infertility, venereal diseases, irregular menstruation, the incidence of some types of malignant tumors such as uterine tumors and breast cancer in addition to colon tumors.[2] Genes play an important role as genes may cause dysfunction that leads to obesity. However, individuals with a genetic predisposition to obesity don't need to be obese.[3] The use of medicinal herbs has spread as one of the methods of treating obesity, and there are several ways in which herbs work to reduce weight, treat obesity, and burn fat, as a group of herbs works to increase the speed of metabolic processes in the body related to demolition and construction, and thus increase the process of burning fat in the body and its metabolism., Thymus and fennel extract exhibited a high concentration of phenolic compounds (58.1 mg/g), flavonoids (7.23 mg/g), and carotenoids (0.52 mg/g).[4] Additionally, the ethanolic extract of Phyllanthus was found to have considerable quantities of total phenolic compounds and exhibit antioxidant activity.[5,6]

The fructose polymer inulin has glycosidic connections of the B-(2-l) type.[7] In the digestive tract, it acts like soluble fiber because it dissolves in water and is resistant to hydrolysis by human digestive enzymes. The soluble fiber could become more viscous as a result. The viscosity of the stomach's contents may be increased, which may slow down the rate at which water, nutrients, and lipids are ejected from the stomach. It may also alter hormone secretions, which affect lipid metabolism. It was discovered that the effects of thymus and fennel extracts were comparable to those mentioned.[8,9] This work aims to evaluate the effect of some herbs and plants found in the Al-Baha region in reducing weight in obese rats.

MATERIALS AND METHODS

Materials:

This study was carried out using three types of vegetable peels and two types of herbs that were commonly used in the Al-Baha region, The tested plants were *Citrullus lanatus, Solatium melongena,* and *Pisum sativum* while the tested herbs were *Thymus vulgaris*, *Foeniculum vulgare* which purchased from the local market, in Al-Baha city and authenticated by the institute botanist.

Rats: Forty obese albino female rats, mean weight was 175 ± 5g. Casein, starch, salt mixture, cellulose, and vitamin mixture were purchased from Gommhoryia Company.

Methods:

Preparation of samples: Fresh plants were cleaned from the damaged leaves washed with tap water and dried in an air drying oven at 50°C. The dried herbs and vegetable peels were ground using an electric stainless-steel mill to powder and kept at 20°C until use. The composition of the control and experimental diets are mentioned in the table 1.

Table 1: The composition of control and experimental diets (g/100 g diet)

Ingredients Groups	Control	G1	G2	G3	G4	G5	G6	G7
Corn starch	67.6	47.6	47.6	47.6	47.6	47.6	47.6	47.6
Casein	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
Corn oil	10	10	10	10	10	10	10	10
Salt mix	4	4	4	4	4	4	4	4
Vit. Mix	1	1	1	1	1	1	1	1
Bran	5	5	5	5	5	5	5	5
DL-Methonin	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Choline chloride	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Citrullus lanatus	-	10	5	5	-	-	-	5
Solarium melongena	-	5	10	5	-	-	-	5
Pisum sativum	-	5	5	10	-	-	-	2.5
Thymus vulgaris	-	-	-	-	5	10	5	2.5
Foeniculum vulgare					10	5	5	2.5
	99.0	99.0	99.0	99.0	99.0	99.0	99.0	89.0

Obesity induction: The basic diet contains 40 g of maize oil per kg of diet and provides around 9.5% of its energy from fat. A high-fat diet (HFD) that derives at least 45% of its energy from fat was utilized to promote obesity. The basic diet was changed to include 40 grams of maize oil plus 200 grams of ghee per kilogram of food, and the quantity of additional saturated fat was replaced with corn starch.[9]

Experimental animal design: There were 8 groups of rats, 5 rats in each group were fed various diets for a total of 28 days as follows.:

Group 1: Control group five rats fed on a high-fat diet as control.

Group 2: Five obese rats fed on a basal diet with formula supplemented with *Citrullus lanatus*, *Solarium melongena*, and *Pisum sativum* (10%, 5%, 5%) as a mixture (1).

Group 3: Five obese rats fed a diet with formula supplemented with *Citrullus lanatus, Solarium melongena*, and *Pisum sativum* (5%, 10%, 5%) as a mixture (2).

Group 4: Five obese rats fed on a diet with formula supplemented with *Citrullus lanatus*, *Solanum melongena*, and *Pisum sativum* (5%, 5%, 10%) as a mixture (3).

Group 5: Five obese rats fed on a diet with formula supplemented with *Thymus vulgaris*, and *Foeniculum vulgare* (5%, 10%) as a mixture (4).

Group 6: Five obese rats fed on a diet with formula supplemented with *Thymus vulgaris*, and *Foeniculum vulgare* (10%, 5%) as a mixture (5).

Group 7: Five obese rats fed on a diet with cake supplemented with *Thymus vulgaris*, and *Foeniculum vulgare* (5%, 10%) as a mixture (6).

Group 8: Five obese rats fed on a diet with cake supplemented with *Citrullus lanatus*, *Solanum melongena*, *Pisum sativum* and *Thymus vulgaris*, *Foeniculum vulgare* (5%, 5%, 2.5%, 2.5%, 2.5%) as a mixture (7).

Forty female albino rats, Sprague Dawley strain, mean weight was 175±5g. The animals were divided into eight homogeneous groups and housed individually in stainless steel cages fitted with a wire mesh bottom and front in a room maintained at 25-30°C with about 50% relative humidity. The room was lighted on a daily photoperiod of 12 hours light and 12 hours dark. They were allocated to various experimental diets for 4 weeks. During the conditioning period and throughout the trial food and tap water.

Biological evaluation:

Blood sampling: After the trial, rats were slaughtered under ether anesthesia (28 days). The retro-orbital approach was used to collect blood samples in a clean, dry centrifuge tube. They were allowed to coagulate at room temp before centrifuging for fifteen min at 1500 pm. Serum was obtained using a wash and dry syringe, placed in Wasserman tubes, and preserved at -10 °C until biochemical analysis. The livers, spleens, lungs, hearts, and kidneys of the rats were then separated and washed in saline before being weighed and dried. The weight values of the mentioned organs were calculated using the procedure outlined below.[10] The feed efficiency ratio (FER), food intake (consumption), bodyweight gain percent (BWG percent), and feed efficiency ratio are calculated by the equation.[11]

Biochemical analysis:

The collected serum samples were analyzed for the following biochemical parameters. Determination of glucose: Serum glucose levels were measured using the technique outlined in the article.[12] Completed blood count (CBC) test: That test includes WBC count, HB, RBC count, and platelet count (PLC), the results of CBC are generated by highly automated electronic and pneumatic multichannel analyzers based on aperture-impedances and/or laser beam cell sizing and counting.[13] Determination of Liver

functions: Determination of GPT (ALT) & of GOT (AST), Alanine aminotransferase (ALT), and Aspartate aminotransferase (AST) activity was determined calorimetrically according to the method described in the article.[14] Determination of (ALP), Determination of alkaline phosphatase (ALP). Kits were obtained from Biosystems S.A. Kits, Barcelona (Spain). Serum ALP was determined according to the methods described in the article.[15] Determination of kidney functions: Determination of creatinine and serum creatinine in plasma was determined by the kinetic method according to the methods described in the article.[16] Determination of serum albumin: Photometrically measured absorbance with a maximum at 578 nm and the formation of an albumin bromocresol green complex at pH 4.2.[17] Determination of uric acid: Uric acid was determined by enzymatic colorimetric test using kits according to the methods described in the article.[18] Determination of serum urea: Enzymatic determination of serum urea was carried out according to the methods described in the article.[18] Determination of serum lipids profile: Determination of triglycerides: The determination of triglycerides in serum was calorimetrically determined according to the methods described in the article.[19] Determination of total cholesterol: Total cholesterol was determined by the colorimetric method according to the methods described in the article.[20] Determination of HDL-Cholesterol: HDL cholesterol was determined according to the methods described in the article.[21] Determination of LDL: LDL is calculated according to the methods described in the article.[22]

Statistical analysis: The mean and SD were used to express all results. With the help of the statistical software for social science for Windows, statistical analyses were performed (SPSS, version 11.0 Chicago, DL-USA). One-way analyses of variance were used to analyze the results (ANOVA). The p-value of 0.05 was considered statistically significant.[23]

RESULTS AND DISCUSSION

Chemical composition of different tested mixtures

Different mixtures were analyzed for their chemical composition i.e., carbohydrates, protein, fat, fiber, and ash. The obtained results are shown in Table 2.

Table 2: Chemical composition of different mixtures (on a dry weight basis)

Samples	Chemical composition (%)				
	Protein	Fat	Fiber	Ash	Total Carbohydrate
Mixture 1	3.11	2.12	11.15	6.89	76.73
Mixture 2	3.22	1.45	12.61	6.15	76.57
Mixture 3	4.43	1.57	16.78	6.32	70.90
Mixture 4	4.92	0.65	11.98	10.76	71.69
Mixture 5	4.32	0.32	12.32	11.12	71.92
Mixture 6	3.53	0.21	13.23	12.23	70.8
Mixture 7	5.76	1.65	15.34	15.31	61.94

Mixture 1: *Citrullus lanatus, Solanum melongena, Pisum sativum* (10%, 5%, 5%).
Mixture 2: *Citrullus lanatus, Solanum melongena, Pisum sativum* (5%, 10%, 5%).
Mixture 3: *Citrullus lanatus, Solanum melongena, Pisum sativum* (5%, 5%, 10%).
Mixture 4: *Thymus vulgaris, Foeniculum vulgare* (5%, 10%).
Mixture 5: *Thymus vulgaris, Foeniculum vulgare* (10%, 5%).
Mixture 6: *Thymus vulgaris, Foeniculum vulgare* (5%, 5%).
Mixture 7: *Citrullus lanatus, Solanum melongena, Pisum sativum, and Thymus vulgaris*, (5%, 5%, 2.5%, 2.5%).

From the results presented in Table 2, we noticed that mixture 1 contained 3.11, 2.12, 11.15, 6.89, and 76.73 protein, fat, fiber, ash, and carbohydrates respectively. Concerning mixture 2, it was found to

contain 3.22, 1.45, 12.61, 6.15, and 76.57% protein, fat, fiber, ash, and carbohydrates respectively, while mixture 3 contained 4.43, 1.57, 16.78, 6.32, and 70.90% of the same content, respectively. On the other hand, mixture 4 (plants) contained 4.92, 0.65, 98, 10.76, and 71.69% protein, fat, fiber, ash, and carbohydrates respectively. Mixture 5 contained 4.32, 0.32, 12.32, 11.12, and 71.92% of the same content respectively while, 3.53, 0.21, 13.23, 12.23, and 70.8% of the mixture 6 content. Mixture 7 which consists of all the herb and plant peels contained 5.76, 1.65, 15.34, 15.31, and 61.94% of protein, fat, fiber, ash, and carbohydrates respectively. From these results, it could be noticed that mixture 7 followed mixtures 4 and 3 contained the highest protein, mixtures 3 and 7 contained the highest level of fat, fiber, and ash mixtures 6 and 7 were the highest level while mixture 1 contained the highest carbohydrates. Eggplant byproduct contains 10.5% protein and 0.5% ash.[24]

Effect of feeding rats on different formula mixtures on feed intake (FI), body weight gain (BWG), the feed efficiency ratio (FER), and adiposity index of obese rats

Feed intake (FI):

Data given in Table 3 illustrates the effect of feeding rats on different formula mixtures on feed intake. We observed that in rats feeding on the fatty diet (control), the feed intake (FI) was 10.5 ± 0.13 g/day. Rat fed on formula mixture 3 followed 1 and 5, the weight gain was increased than the control group. This increase in groups 1 and 3 was statically nonsignificant, there is no significance between groups 1, 2, 5, and the control group. The seventh group was the lowest one in feed intake.

Table 3: Effect of feeding rats on different formula mixtures on feed intake (FI), body weight gain (BWG), feed efficiency ratio (FER), and adiposity index of obese rats.

Groups	Parameters			
	Feed intake g/day	Body weight gain g/day	Feed efficiency ratio g/day	Adiposity index
G1Control (obese rats)	10.5b±0.13	2.41a±0.56	0.229a±0.02	1.26a±0.07
G2 (mixture 1)	10.9a±0.28	1.97b±0.51	0.181b±0.011	1.10c±0.10
G3 mixture 2	10.54b±0.35	1.28c±0.09	0.121 c±0.031	0.82d±0.05
G4 mixture3	11.38a±0.28	0.92e±0.46	0.08 lc±0.007	0.78d±0.03
G5 mixture 4	9.78d±0.35	1.07d±0.82	0.109c±0.016	0.80d±0.03
G6 mixture 5	10.83b±0.23	1.58b±0.71	0.145b±0.02	1.08c±0.02
G7 mixture 6	10.38c±0.18	1.92b±0.46	0.185b±0.007	1.18b±0.01
G8 mixture 7	9.38d±0.08	0.52f±0.16	0.055d±0.007	0.58e±0.02
L.S.D	1.43	0.12	0.031	0.002

Values are mean ± SD.

Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

Body weight gain:

The results of feeding rats various formula combinations on body weight gain are given in Table 3. We noticed that the body weight gain (BWG) in rats feeding on a diet with high-fat content in the control group was higher than that of the other groups. It was 2.14 ± 0.56 g/day. All the mean values of body weight gain of tested formula groups were lower than the control. Differences between all mean values were significant when compared to the control group. There are no significant differences between groups 1, 5, and 6. The lowest group in body weight gain was the last group which recorded 0.52 ± 0.16 g/ day.

Feed efficiency ratio:

Data given in Table 3 indicated that the feed efficiency ratio (FER) of the obese rats (control) group was 0.229±0.02 g/day. The results denoted that the feed efficiency ratio of all groups decreased compared to the control group. There are no significant differences between groups 2, 3, and 4 also, between groups (1

and 6). Meanwhile, rats fed in group 7 which contained all the tested plant's peel and herbs showed a significant decrease compared to control rats which were 0.055 ± 0.007g/day.

Adiposity index:

From the same table, the adiposity which is indexed to the sum of adipose pads to body weight, is multiplied by 100. The highest mean value was recorded in the control group and the lowest one was rats of group 7. This difference was statistically significant. There is no significant between groups 2, 3, and 4 and also, between 1 and 5.

Effect of feeding rats on different mixtures formula on some relative organ weight of obese rats

The information in Table 4 demonstrates how feeding rats with various mixing formulas affected the relative weight of specific organs. For the group of obese rats, it could be seen that the relative weights of the liver, kidney, and large intestine were 2.73x0.04, 0.59x0.02, and 0.56x0.02g body weight, respectively. Rats fed combination 7 had relative weights of the aforementioned organs of 1.960.35, 0.340.29, and 0.340.11 bw, respectively, while rats fed mixture 3 had the highest relative weight. The results indicated that group 4's relative liver weight increased significantly when compared to the other evaluated group combinations.

For the weight of the liver, there are no significant differences between rats fed on G2 (mixture 2) and G5 (mixture 5) also, between G1 (mixture 1) and G6 (mixture 6).

Regarding kidney relative weight, there were significant decreases in G2 (mixture 2) G4 (mixture 4), and G6 (mixture 6) compared to the control group, which were 0.43±1.21 and 0.46±0.51 g, 0.46±0.51 and 0.59±0.02g and at the same time there was significant decrease in G1 (mixture 1) and G3 (mixture 3) and G3 recorded 0.51±0.19. According to data given in the same table 4, it is clear that large intestine relative weight showed the highest significant decrease in G3 (mixture 3) and G7 (mixture 7) compared to control (obese rats) which the mean levels were 0.40±0.03, 0.34±0.11 and 0.56±0.02g body weight respectively.

Table 4: Effect of feeding rats on different formula mixtures on some relative organ weight (g) of obese rats

Groups	Organs		
	Relative Liver Weight (g)	Relative Kidney Weight (g)	Relative Large Intestine Weight (g)
G1Control (obese rats)	2.73^{a}±0.04	0.59^{a}±0.02	0.56^{a}±0.02
G2 (mixture 1)	2.46^{d}±0.57	0.50^{b}±0.23	0.48^{b}±0.11
G3 mixture 2	2.52^{c}±0.14	0.43^{c}±1.21	0.46^{b}±0.07
G4 mixture3	2.28^{c}±0.28	0.51^{b}±0.19	0.40^{c}±0.03
G5 mixture 4	2.63^{b}±2.14	0.46^{c}±0.51	0.51^{a}±0.02
G6 mixture 5	2.56^{c}±0.35	0.54^{a}±0.29	0.53^{a}±0.21
G7 mixture 6	2.43^{d}±2.14	0.46^{c}±0.51	0.51^{a}±0.12
G8 mixture 7	1.96^{r}±0.35	0.34^{d}±0.29	0.34^{d}±0.11
L.S.D	1.82	0.31	0.31

Values are mean ± SD.

Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

Effect of feeding rats on different formula mixtures on blood glucose of obese rats

The data given in Table 5 showed the effect of feeding rats on different mixtures of formula on blood glucose levels. The results in Table 5 indicated that the mean value of glucose for rats fed a high-fat diet as the control group was 199.5 ± 2.21mg/dl, while the glucose level fed on mixture 7 was 78.6 ± 2.5mg/dl was the lowest result. There was a significant decrease in all groups as compared control group (obese

rat) except G1 and G4, which were 170.5±2.76 and 175.3 ± 1.1 mg/dl respectively. There are no significant differences between the two groups.

Table 5: Effect of feeding rats on different formula mixtures on blood glucose level of obese rats.

Groups	Parameter
	Glucose (mg/dl)
G1Control (obese rats)	199.53±2.21
G2 (mixture 1)	170.5^{b}±2.76
G3 mixture 2	158.2^{d}±2.5
G4 mixture3	97.5^{f}±1.4
G5 mixture 4	175.3^{b}± 1.1
G6 mixture 5	168.6^{C}±2.5
G7 mixture 6	140.3^{s}±1.1
G8 mixture 7	78.6^{s}±2.5
L.S.D	7.54

Values are mean ± SD.

Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

Complete blood cell (CBC) parameters of obese rats fed on different formula mixtures

A- Red Blood Cells (RBC):

The data given in Table 6 showed the effect of feeding rats on different mixture formulas on red blood cell count.

Results of Table 6 showed non-significant changes in the control group (obese rats) and mixture 2 on red blood cell count. Also, there are no significant differences between G1, G3, G4, and G6. From the same table, it could be noticed that the control group was the highest level of red blood cells and rats fed on mixture 7 was the lowest one.

Table 6: Complete blood cell (CBC) parameters of obese rats fed on different mixtures formula.

Groups	Parameters			
	Hemoglobin (g/dl)	RBC x 106	WBC X 103	PLC X103
G1Control (obese rats)	14.033±0.23	6.03^{a}±2.14	5.3^{a}±1.12	398^{a}±2.54
G2 (mixture 1)	13.4^{a}±0.03	5.6^{b}±1.01	4.5^{b}±1.34	364^{b}±2.94
G3 mixture 2	13.7^{a}±2.43	5.87^{a}±1.06	4.3^{b}±0.95	387^{a}±2.45
G4 mixture3	13.46^{a}±1.76	5.62^{b}±0.97	4.1^{b}±0.23	249^{c}±3.34
G5 mixture 4	13.33^{a}±0.05	5.59^{b}±0.09	4.6^{b}±2.11	$34l^{c}$±3.13
G6 mixture 5	13.0^{b}±0.001	5.41°±0.05	4.5^{b}±1.01	387^{a}±2.45
G7 mixture 6	13.13^{b}±0.05	5.55^{b}±0.09	4.6^{b}±2.11	$34l^{c}$±3.13
G8 mixture 7	11.0^{c}±0.001	4.91^{d}±0.05	3.5^{C}±1.01	187^{d}±2.45
L.S.D	0.91	2.004	0.97	2.071

Values are mean ± SD.

Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

B- White blood cells (WBC):

The data presented in Table 6 showed the effect of feeding rats on different mixtures formula on white blood cell count in obese rats. It is clear from Table 6 that in rats fed on a control diet, the white blood cell count in obese rats was 5.3 ± 1.12x10. There were significant differences between all groups and the control group. While there are no significant differences between groups from 1 to 6. Group 7 recorded the lowest level of WBC.

C- Hemoglobin:

The data given in Table 6 showed the effect of feeding rats on different mixture formulas on hemoglobin levels. It is clear from Table 6 that in rats fed the control diet, the hemoglobin levels were 14.03±0.23g/dl,

while rat groups 5, 6, and 7 showed a significant decrease when compared to rats fed on the control diet. There are no significant differences in the hemoglobin levels between G1, G2, and G3 as compared to control (obese rats). Rats fed on mixture 7 had the lowest hemoglobin level.

D- Platelet count (PLC):

The impact of various combinations of formulas on platelet count in obese rats is given in Table 6, showing that group 7's platelet count decreased significantly compared to the other groups. There were no statistically significant differences between the mean scores of 3872.45 in Group 2 and G5 and 3872.45 in Group 5 and the Control Group, also there are no significant differences observed in G3, G4, and G6.

Effect of feeding rats on different mixtures formula on liver functions of obese rats

A- Aspartate amino transaminase (AST or GOT) enzyme:

The aspartate amino transaminase (AST) enzyme serum levels were affected by feeding rats various mixes, according to the results shown in Table 7. Rats fed in the control group had an average level of the AST enzyme of 56.1 + 1.27U/L, while the average levels of the other groups significantly decreased when compared to the control group. The mean values of the same groups were 45.20.21 in the same table 7, which demonstrated that there was no difference in aspartate amino transaminase (AST) enzyme activity between groups (G1, G2, G4, and G6) as compared to the control group., 42.1±0.52, 44.7±0.35 and 44.7±0.35 U/L respectively, that considered the best group observed for rats fed on the mixture.

Table 7: Effect of feeding rats on different mixtures formula on liver functions of obese rats.

Groups	Parameters		
	AST(U/L)	ALT(U/L)	ALP(U/L)
G1Control (obese rats)	56.1^{a}±1.27	29.8^{a}±4.31	90.1^{a}±2.97
G2 (mixture 1)	45.2^{C}±0.21	22.9^{C}±2.31	87.7^{a}±1.41
G3 mixture 2	42.1^{c}±0.52	24.4^{b}±2.21	84.1^{b}±6.01
G4 mixture3	37.5^{d}±0.31	19.4^{d}±1.5	76.7^{C}±2.16
G5 mixture 4	44.7^{C}±0.35	24.7^{b}±0.25	89.7^{a}±0.35
G6 mixture 5	49.1^{b}±0.16	24.9^{b}±0.52	83.7^{b}±0.16
G7 mixture 6	44.7°±0.35	24.7^{b}±0.25	89.7^{a}±0.35
G8 mixture 7	29.1^{e}±0.16	18.9^{C}±0.52	73.7^{C}±0.16
L.S.D	3.98	4.02	3.11

Values are mean ± SD.

Values in the same column sharing the same superscript letters are not statistically significantly different at ($p<0.05$)

B- Alanine aminotransferase (ALT or GPT) enzyme:

The effects of feeding rats various mixes on the serum levels of the alanine aminotransferase (ALT or GPT) enzyme were demonstrated by the data in Table 7. It was shown that rats fed a high-fat meal had serum levels of (ALT) enzyme activity of 29.8 4.31 U/L, compared to 18.9 0.52 U/L in the rats fed combination 7. While other groups were shown to have significantly lower serum levels of (ALT) enzyme activity when compared to controls (obese rats). The outcomes from groups 2, 4, 5, and 6 do not significantly differ from one another. Rats fed combination 7 demonstrated a substantial drop in serum (ALT) enzyme activity when compared to control, the value was 18.9±0.52U/L.

C- Alkaline phosphates (ALP) enzyme:

The effects of feeding rats various mixture formulas on serum levels of the alkaline phosphates (ALP) enzyme were demonstrated by the data in Table 7. The data in Table 7 showed that rats fed in the control group had an average level of (ALP) enzyme of 90.1-2.97U/L, with group 7 having the lowest level. These findings show that there are no discernible variations in the mean value of the (ALP) enzyme for (G1, G4,

G6, and the control group), the mean values were 87.7±1.41, 89.7a±0.35, 89.7±0.35 and 90.1±2.97U/L respectively, considering the best group rat on mixture 3 which in a normal level.

DISCUSSION

With obesity, a person's health may be in danger due to excess body fat. An imbalance between energy intake and energy expenditure leads to excess body fat. The sum of the energy used during physical activity, while at rest, and for metabolism.[1] The body contains huge amounts of white adipose tissue, which serves as a representative adipose tissue. White adipose tissue is an organ that stores neutral fat as excess energy after eating and releases stored fat and glucose as fuel when it's needed. Only at certain ages did the body produce more mature adipocytes.[2] Obesity has emerged as a major global health issue with considerable effects on cardiovascular disease as well as numerous other linked conditions, with infertility being particularly prominent.[3]

According to numerous studies, thymus and Phyllanthus extract both contain significant levels of key substances that may work as antioxidants. For instance, according to Yassin et al. (2007), High levels of phenolic compounds (58.1 mg/g), flavonoids (7.23 mg/g), and carotenoids (0.52 mg/g) were found in thymus and fennel extract[25,26] found that the Phyllanthus ethanolic extract had a high total phenolic component content., antioxidant activity, and the ability to scavenge free radicals. Inulin and fructooligosaccharides are the primary active components of thymus and fennel extract, based on the research.[6]

Having B-(2-l) glycosidic links, inulin is a fructose polymer (Wight and Niekerk, 1983). It acts like soluble fiber because it dissolves in water and cannot be broken down by human digestive enzymes. The soluble fiber could become more viscous as a result. The viscosity of the stomach's contents may be increased, which may slow down the rate at which water, nutrients, and lipids are ejected from the stomach. It may also alter hormone secretions, which affect lipid metabolism.

Oligofructose, a short-chain fructan derived from thymus and fennel inulin, may increase satiety, leading to higher reductions in calorie intake and protecting against body weight gain and fat mass growth in normal and obese rats.[8] Thymus and fennel extract's impact on calorie intake and body composition The phyllanthus, thymus, plants like fennel and dandelion, which are included in the herbal blend, include inulin-type fructans, which may influence satiety and thus body weight.[4] Phyllanthus improved lipid profiles by decreasing plasma total cholesterol and triglyceride concentrations. Isoflavones, found in plants like fennel, thyme, and phyllanthus, prevent cholesterol absorption in the intestine by competing with cholesterol in the same locations. These herbs may be responsible for the hypocholesterolemic impact.[3]

The peels of vegetables such as eggplant, watermelon, and peas are very complex in composition and the determination of individual compounds will require the use of several analytical methods. A high number of flavonols and flavonols conjugates and isomers are present in the plant peels and may also be present as a glycoside. The references to these compounds are rarely available, thus it is difficult to determine all the components present in plant matrices.[4]

Thymus and fennel extract exhibit strong hypercholesterolemic and hypotriglyceridemic effects, which may be caused by the presence of inulin, a soluble fiber-like substance with hypolipidemic properties.[27] The study found that feeding thymus, fennel, total blood cholesterol, and triglyceride levels were not significantly affected by either or inulin. Other factors, such as the amount of added dietary cholesterol, the presence or absence of cholic acid, the amount of dietary fiber, and the species, may contribute to the variation in the cholesterolemic impact of identical dietary fibers among studies. The serum lipoprotein results found that feeding rats diets containing 5% thymus and fennel or 5% inulin for four weeks led to increased HDL-c serum concentrations and decreased LDL-c serum concentrations.[27] Additionally,

thymus, fennel, and phyllanthus at 5%, 5%, and 10% groups had significantly higher HDL-c concentrations than the normal control or high-fat groups eggplant *(Solanum melongena)*.[4]

RECOMMENDATIONS

Encouragement of nutrition education programs the supplementation of food with useful herbs such as thyme, and fennel at levels 5,5, and 10%.

Controlling diabetes, hypercholesterolemia, cardiovascular disease, and cancer by using nutritional peels and tested herbs or products to contain high fiber and phenols as antioxidants.

Supplementation of the bakery product especially home bakery by testing vegetable peels to reduce obesity and high cholesterol, because it was rich in fiber.

Financial support and sponsorship

Nil

Conflict of Interest

The author declares that there is no conflict of interest relevant to this article.

REFERENCES

1. Canoy D, Buchan I. Challenges in obesity epidemiology. *Obes Rev*. 2007;8 Suppl 1:1-11.
2. Nutraceuticals/Functional Foods and Health Claims on Foods. (2018). Therapeutic Products Programme and the Food Directorate from the Health Protection Branch. Health Canada. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/hpfb-dgpsa/pdf/label etiquet/nutra-funct_foods-nutra-fonct_aliment-eng.pdf. Accessed June 22, 2022.
3. Reis LO, Dias FG. Male fertility, obesity, and bariatric surgery. *Reprod Sci*. 2012;19(8):778-785.
4. Yassin AF, Chen WM, Hupfer H, et al. Lysobacter defluvii sp. nov., isolated from municipal solid waste. *Int J Syst Evol Microbiol*. 2007;57(Pt 5):1131-1136.
5. Vági E, Rapavi E, Hadolin M, et al. Phenolic and triterpenoid antioxidants from Origanum majorana L. herb and extracts obtained with different solvents. *J Agric Food Chem*. 2005;53(1):17-21.
6. Kocsis I, Hagymasi K, Kery A, Szoke E, Blazovics A. Effects of chicory on pancreas Br. J. Nutr. 2003;47: 143-146
7. Wight DO, Niekerk C. Adsorption design for wastewater treatment. Lewis Publication. Boca Raton. 1983, 189.
8. Cani PD, Neyrinck AM, Maton N, Delzenne NM. Oligofructose promotes satiety in rats fed a high-fat diet: involvement of glucagon-like Peptide-1. *Obes Res*. 2005;13(6):1000-1007.
9. Reeves PG, Nielsen FH, Fahey GC Jr. AIN-93 purified diets for laboratory rodents: final report of the American Institute of Nutrition ad hoc writing committee on the reformulation of the AIN-76A rodent diet. *J Nutr*. 1993;123(11):1939-1951.
10. Drury RA, Wallington E. Carlton's Histological Technique. 5 Ed., 1980, Oxford University.
11. Chapman DG, Castillo R, Campbell JA. Evaluation of protein in foods. I. A method for the determination of protein efficiency ratios. *Can J Biochem Physiol*. 1959;37(5):679-686.
12. Trinder P. Glucose & triglycerides enzymatic colorimetric methods. J. of Ann. Clin. Biochem. 1969;6:24-27.
13. Kawada T, Goto T, Hirai S, et al. Dietary regulation of nuclear receptors in obesity-related metabolic syndrome. *Asia Pac J Clin Nutr*. 2008;17 Suppl 1:126-130.
14. Bergmeyer HU, Scheibe P, Wahlefeld AW. Optimization of methods for aspartate aminotransferase and alanine aminotransferase. *Clin Chem*. 1978;24(1):58-73.
15. Roy SE. Colorimetric determination of serum alkaline phosphatase. Clin. Chem. 1970;16:431-432.

16. Henry RJ. Creatinine Colorimetric Method. Principles of Techniques, 2nd Ed., Harcer and Row Pub, 1974, P.525.
17. Doumas BT, Watson WA, Biggs HG. Albumin standards and the measurement of serum albumin with bromcresol green. *Clin Chim Acta*. 1971;31(1):87-96.
18. Patton CJ, Crouch SR. Spectrophotometric and kinetics investigation of the Berthelot reaction for the determination of ammonia. Anal. Chem. 1977; 49, 464–469.
19. Frati-Munari AC, Fernández-Harp JA, Bañales-Ham M, Ariza-Andraca CR. Decreased blood glucose and insulin by nopal (Opuntia sp.). *Arch Invest Med (Mex)*. 1983;14(3):269-274.
20. Allain CC, Poon LS, Chan CS, Richmond W, Fu PC. Enzymatic determination of total serum cholesterol. *Clin Chem*. 1974;20(4):470-475.
21. Lairon D. Dietary fibres: effects on lipid metabolism and mechanisms of action. *Eur J Clin Nutr*. 1996;50(3):125-133.
22. Lee R, Nieman D. Nutritional assessment. 2nd Ed., Mosby Missouri, 1996, USA
23. Snedecorand C. Statistical Methods 6th Ed. Iowa State University press ames Iowa, 1967, USA.
24. Block CR, Guirardello EA, Silva MT, Veit CG. Removal of Ni (II) ions from aqueous solution by Bioadsorption in the fixed bed column: experimental and theoretical breakthrough curves. *Biochemical Engineering Journal.* 1973;30:184-191.
25. Vági E, Rapavi E, Hadolin M, et al. Phenolic and triterpenoid antioxidants from Origanum majorana L. herb and extracts obtained with different solvents. *J Agric Food Chem*. 2005;53(1):17-21.
26. Amarowicz R, Zegarska Z, Rafalowski R, Pegg R, Karamac M, Kosinska A. Antioxidant activity and free radical-scavenging capacity of ethanolic extracts of thyme, oregano and senna. Eur.J. Lipid Sci. Technol. 2008;110.
27. Kim M, Shin HK. The water-soluble extract of chicory influences serum and liver lipid concentrations, cecal short-chain fatty acid concentrations and fecal lipid excretion in rats. *J Nutr*. 1998;128(10):1731-1736.