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Effect Of Basil (*Ocimum Basilicum*) And Thyme (*Thymus Vulgaris*) Leaves On Biological And Biochemical Changes In Induced Obese Rats

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Abstract

The present study aimed to evaluate the effect of addition different concentrations (2.5 and 5 %) as powder of basil (*Ocimum basilicum*) and thyme (*Thymus vulgaris*) leaves and their mixture on biological, biochemical and anti-obesity changes of obese rats. Forty eight adult albino male rats weighting 140 ±10 g were randomly divided into 8 groups (6 rats each) and fed on the basil diet. The first group as a negative control and the other seven groups were adminstrated by high fat diet (20% animal fat) to induce obese rats. Results showed that the highest body weight gain (BWG) and feed efficiency ratio (FER) recorded for (5%) mixtures from thyme and basil leaves powder, while the lowest BWG and feed intake (FI) recorded for (5%) basil leaves powder. The highest feed intake recorded also for (2.5%) thyme leaves powder. The lowest GOT and GPT recorded for (5%) mixtures of thyme and basil leaves with significant difference. The

lowest cholesterol and triglyceride recorded for group fed on (5%) mixtures of thyme and basil leaves with significant differences. The highest (HDL-c) levels recorded for group fed on (5%) thyme leaves, while the lowest (LDL-c) recorded for group fed on (2.5%) mixtures of thyme and basil leaves. The lowest (VLDL-c) recorded for group fed on (5%) mixtures of thyme and basil leaves. The lowest uric acid, urea and creatinine recorded for group fed on (5%) mixtures of thyme and basil leaves with significant differences. As conclusion, obese rats treated with (5%) mixtures of thyme and basil leaves had improved lipid profile & liver and kidney functions compared with different level of thyme or basil leaves each alone.

Key words: Herbs leaves, Rats, Anti-obesity and Biochemical analysis.

Introduction

Obesity is a medical condition in which body fat accumulates to a certain degree, which may have adverse effects on body, thereby reducing the life anticipation and health status **(Xanthakos, 2009)**. At an individual level, a combination of much food energy intake and a lack of physical activity is thought to explain most cases of obesity. A limited number of cases are due to genetics, medical reasons, or psychiatric illness **(Raj and Kumar, 2010)**.

Obesity is the most common metabolic disease in developed nations and become a global epidemic in recent years. Obesity, especially abdominal obesity, has an association with dyslipidemia characterized by increasing triglyceride (TG) and decreasing high-density lipoprotein cholesterol (HDL-C) concentrations, It is associated with many of chronic diseases, including

diabetes mellitus, hyperlipidemia, coronary artery disease, hypertension and certain cancers **(Flegal *et al.*, 2010).**

There are several risks associated with the pharmacological and surgical intrusion for obesity, suggesting that a dietary intrusion may be the safest and most cost effective option for those who are moderately obese. There are many dietary strategies that have been shown to affect energy balance that results in successful weight loss **(Rains *et al.*, 2011).**

Plants have been used in the management of a broad spectrum of metabolic dysfunction including obesity owing to the presence of plant derived secondary metabolites. They are considered a rich source of natural active components including flavonoids, polyphenols and anthocyanins **(Shahidi, 2012).**

Basil, one of the most popular herbs grown in the world. Sweet basil is the most common culinary basil. It is a tender plant and is used in cuisines worldwide. The leaves of basil may taste somewhat like anise with a strong, pungent, often sweet smell **(Agarwal *et al.*, 2013)**.

Pancreatic lipase (PL), is the key enzyme that hydrolyzes triglyceride to produce glycerol and fatty acids, Thus, the inhibition of PL, is one of the possible approaches to retard the uptake of fat, and consequently, reduce weight and obesity. Polyphenols, including flavonoids and phenolic acids of *O. basilicum* leaves are regarded as a major class of the PL inhibitors **(Rahim *et al.*, 2015).**

Another results of the analysis research explained that the polyphenols contained in basil are very significant in reducing cholesterol levels,

triglycerides, and very low density lipoprotein **(Neeraja *et al.*, 2015).**

Thyme is native to the Western Mediterranean region, extending to south-eastern Italy. Thyme used extensively as a distinctive aroma and flavor to food. The leaves can be used fresh or dried as a spice **(Nadiya *et al.*, 2016).**

Thymol has beneficial effects on high fat diet (HFD) induced obesity in rats. Thymol administration decreased body weight gain, lipids, insulin and leptin levels, and increased the antioxidant potential in the obese rats, and attenuated visceral fat accumulation **(Saravanan and Pari 2016).**

Vidhya *et al.*, (2016) found that thyme led to decline in plasma triglycerides and total cholesterol when compared to the diabetic rats.

Therefore, the aim of this work was to study the effect of thyme leaves and basil leaves as powder and their mixture on obese rats.

Material and Methods

Materials:

Basil (*Ocimum basilicum*) and thyme (*Thymus vulgaris*) leaves were obtained from Carrefour Market, Tanta city, Gharbia Governorate, Egypt.

A total of 48 adult normal male albino rats, Sprague Dawley strain, weighing 140±10 g were obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt. The animals were kept under observation for one week as an adaptation period before experiment and fed on standard diet according to AIN-93 guidelines **(Reeves *et al.*, 1993).** The basal diet comprised of casein (120 g/kg), corn starch (677g/kg), cellulose (50g/kg), corn oil (100 g/kg), mineral mixture (40g/kg), vitamins mixture

(10g/kg) and DL-methionine (3g/kg), which were obtained from Morgan Co. Cairo, Egypt

Chemical kits used for determination the (TC, TG, HDL-c, AST, ALT urea, uric acid and creatinine) were obtained from Al-Gomhoria Company for Chemical, Medical and Instruments, Cairo, Egypt.

Methods

Preparation of basil and thyme leaves powder

- These plants were dried by air oven at 25°C for 4 hr., milled to obtain the powder form.

Experimental design

Rats were randomly divided into 8 groups (6 rats each); the first: Negative control group was fed the basal diet, from 2 to 8 groups fed on high fat diet (20% animal lipid) for 28 days to induce obesity. The second group served as positive control group and fed on high fat diet. The third and fourth group (obese rats) fed on thyme leaves powder at the level of 2.5% and 5% respectively. The fifth and sixth group fed on basil leaves powder at 2.5% and 5% respectively. The seventh and eighth group fed on mixture of thyme and basil leaves as powder at 2.5% and 5% respectively. During the experimental period, the body weight and feed intake were estimated weekly and daily, respectively. The general behavior of rats was observed. The experiment period was taken 28 days, at the end of the experimental period each rat weighted separately then, After fasting for 12 hours, blood samples were collected into a dry clean centrifuge glass tubes and left to clot in water bath (37°C) for 30 minutes, then centrifuged for 10 minutes at 3000 rpm to separate the serum, which were carefully aspirated and transferred into clean cuvette tube and then kept in deep freezer till

analysis according to method described by **Schermer (1967)**.

Body weight gain (BWG), feed intake (FI), and feed efficiency ratio (FER):

During the experimental period (28 days) the net feed intake was weekly recorded, while body weight was daily recorded. The net feed intake and gained body weight were used for the calculation of feed efficiency ratios (FER) according to **Chapman *et al.*, (1959)** as follows:

$$\text{FER} = \frac{\text{Body weight gain (g)}}{\text{Feed intake (g)}}$$

Biochemical analysis:

Serum total cholesterol was determined according to the colorimetric method described by **Thomas (1992)**. Serum triglyceride was determined by enzymatic method using kits according to the **Fossati and Principe, (1982)**. HDL-c was determined according to the method described by **Grodon and Amer (1977)**. The determination of low density lipoprotein cholesterol (LDL-c) and very low density lipoprotein cholesterol (VLDL-c) were carried out according to the methods of **lee and Nieman (1996)** as follows :LDL-c = Total cholesterol - (HDL-c + VLDL-c).
VLDL-c = TG/5.

Serum levels of alanine amino transferase (ALT) and serum asparatate amino transferase (AST), were were assayed by the methods of **Hafkenscheid (1979) and Clinica Chimica Acta (1980)**, respectively.

Serum urea and creatinine were determinated by enzymatic method according to **Henry (1974)** & **Patton and Crouch (1977)**.

Serum uric acid was determined colorimetrically according to the method of **Barham and Trinder (1972).**

Statistical analysis:

The data were analyzed using a completely randomized factorial design **(SAS, 1988)** when a significant main effect was detected; the means were separated with the Student-Newman-Keuls Test. Differences between treatments of ($P \leq 0.05$) were considered significant using Costat Program. Biological results were analyzed by One Way ANOVA.

Results And Discussion

Effect of thyme and basil leaves and their mixture at different levels on body weight gain, feed intake and feed efficiency ratio of obese rats:

Data presented in table (1) the effect of thyme and basil leaves powder at different levels on body weight gain (BWG), feed intake (FI) and feed efficiency ratio (FER) of obese rats. The obtained results showed that the body weight gain (BWG) of positive control recorded the highest value when compared with negative control with significant difference. The mean values were 55.63 and 19.80 g/28 days, respectively. It is clear to notice that the highest (BWG) recorded for (5%) mixtures from thyme and basil leaves powder, while the lowest BWG recorded for (5%) basil leaves powder with significant difference ($P \leq 0.05$) compared with positive group. The mean values were 53.22, 39.06 and 55.63 g/28 days, respectively.

In case of feed intake (FI), it could be notice that the feed intake of positive control recorded the highest value when compared with negative control with significant difference. The mean values were 28.03 and 19.70 g/day, respectively. From obese rat groups, it is

obvious that the highest feed intake recorded for (2.5%) thyme leaves powder, while the lowest FI recorded for (5%) basil leaves powder with significant difference ($P \leq 0.05$) compared with positive group. The mean values were 26.45, 21.45 and 28.03 g/day, respectively.

The obtained results indicated that the highest numerical feed efficiency ratio (FER) recorded for positive control group, while the lowest value recorded for negative control group with significant differences. The mean values were 0.071and 0.036%, respectively. On the other hand, the highest feed efficiency ratio of treated group recorded for (5%) mixtures of thyme and basil leaves powder, while the lowest FER recorded for (2.5%) basil leaves powder with significant differences compared with positive group. There is no significant change between group fed 5%mixture and positive control group. These results are in agreement with **Cho *et al.*, (2012)**, who reported that carvacrol from thyme supplemented to a high-fat diet (HFD) at 0.01%, 0.05%, and 0.1% levels for 28 days, exhibited a dose-dependent reduction in the body weight of mice. In a follow-up study, after 10 weeks of feeding with 0.1% carvacrol supplemented in the diet (equivalent to 100 mg/kg body weight), the body weight gain, and visceral fat-pad weights of the carvacrol-supplemented diet group were significantly lower than that of HFD mice and this treatment effect was not due to changes in food intake as the daily feed intake during the entire feeding period did not differ among groups.

Effect of thyme and basil leaves powder and their mixture at different levels on GPT and GOT of obese rats

Data presented in table (2) the effect of thyme and basil leaves on GPT and GOT of obese rats. The

obtained results showed that the GPT of positive control recorded the highest value when compared with negative control with significant difference. The mean values were 107.00 and 43.50 U/L, respectively. From obese rat groups, it is clear to notice that the highest GPT recorded for (2.5%) basil leaves as compared with the other groups, while the lowest GPT recorded for (5%) mixtures of thyme and basil leaves with significant difference ($P \leq 0.05$) compared with positive group. The mean values were 81.50, 48.00 and 107.00 U/L respectively.

In case of GOT, it could be notice that the GOT of positive control recorded the highest value when compared with negative control with significant difference. The mean values were 72.50 and 33.50U/L, respectively. From obese rat groups, it is obvious that the highest GOT recorded for (5%) basil leaves, while the lowest GOT recorded for (5%) mixtures of thyme and basil leaves with significant difference ($P \leq 0.05$) compared with positive group. The mean values were 63.00, 44.00 and 72.50, U/L respectively. Similar results were recorded by **Lee *et al.*, (2005)** who found that basil extract significantly lowered the serum levels of the hepatic enzyme markers aspartate amino transferase and alanine amino transferase and reduced the indicators of oxidative stress in the liver.

Effect of thyme and basil leaves and their mixtures at different levels on total cholesterol and triglycerides level of obese rats:

The effect of thyme and basil leaves at different levels on the serum total cholesterol and triglycerides of obese rats is shown in table (3). The obtained results indicated that the cholesterol levels of positive control group recorded the highest value when compared with

negative control group with significant difference (P≤0.05). The mean values were 150.0and 109.5 mg/dl, respectively. While, the highest cholesterol levels recorded for group fed on (2.5%) thyme leaves but, the lowest value recorded for group fed on (5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 103.50, 69.00 and 150.0 mg/dl, respectively .

In the other hand, the triglyceride of positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 91.50and 37.50mg/dl, respectively. While, the highest triglyceride recorded for group fed on (2.5%) thyme leaves but, the lowest value recorded for group fed on (5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 83.50, 63.50 and 91.50 mg/dl, respectively. These results agree with **Gou and Wang (2012)** who found that thyme had physiological and biochemical effect such as hypoglycemia and increase in appetite, also significant decrease in total cholesterol and triacylglycerol levels were found.

Effect of thyme and basil leaves and their mixtures at different levels on lipid profile level of obese rats:

The effect of thyme and basil leaves on at different levels the serum lipid profile (HDL-c, LDL-c and VLDL-c) of obese rats is shown in table (4). The obtained results indicated that the high density lipoprotein (HDL-c) levels of negative control group recorded the highest value when compared with positive control group with a significant difference (P≤0.05). The mean values were 67.00and 32.50 mg/dl,

respectively. While, the highest (HDL-c) levels recorded for group fed on 5% thyme leaves but, the lowest value recorded for group fed on 5% mixture of thyme and basil leaves with a significant difference (P≤0.05) compared with positive group. The mean values were 50.50, 32.50 and 32.50 mg/dl, respectively.

Data also showed that the low density lipoprotein (LDL-c) levels of positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 64.70and 35.00mg/dl, respectively. While, the highest (LDL-c) levels recorded for group fed on (2.5%) basil leaves but, the lowest value recorded for group fed on (2.5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 41.40, 21.90 and 64.70 mg/dl, respectively .

In case of very low density lipoprotein (VLDL-c) levels, the positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 18.30and 7.50mg/dl, respectively. While, the highest (VLDL-c) levels recorded for group fed on (2.5%) thyme leaves but, the lowest value recorded for group fed on (5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 16.70, 12.70 and 18.30 mg/dl, respectively.

These results are in agreements with **Javanmardi *et al.,*(2002)** reported that the sweet basil *(O. basilicum)* one of the plant foods has beneficial effect on plasma and liver lipid profiles after chronic high fat diet treatment regarding to increased triglycerides, total and low density lipoprotein

cholesterol in hyper- cholesterolemic diet fed rat's model.

Effect of thyme and basil leaves and their mixtures at different levels on kidney function level of obese rats:

Data presented in table (5) show the effect of thyme and basil leaves at different levels on the kidney functions (uric acid, urea and creatinine) level of obese rats. It is clear to notice that the uric acid levels of positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 9.00and 5.00 mg/dl, respectively. While, the highest uric acid levels recorded for group fed on (2.5%) thyme leaves but, the lowest value recorded for group fed on (5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 7.95, 5.25 and 9.00mg/dl, respectively.

Data also indicated that the urea levels of positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 55.00 and 28.00 mg/dl, respectively. While, the highest urea levels recorded for group fed on (2.5%) thyme leaves but, the lowest value recorded for group fed on (5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 40.50, 29.50 and 55.00 mg/dl, respectively.

In case of creatinine levels, data showed that the positive control group recorded the highest value when compared with negative control group with significant difference (P≤0.05). The mean values were 1.85 and 0.78 mg/dl, respectively. While, the highest creatinine

levels recorded for group fed on (2.5%) basil leaves but, the lowest value recorded for group fed on (5%) mixtures of thyme and basil leaves with significant difference (P≤0.05) compared with positive group. The mean values were 1.13, 0.84 and 1.85mg/dl, respectively.

These results are in agreement with **Shirpoor *et al.*, (2007)** reported that the treatment of the diabetic rats with thyme oil caused reduction in the serum creatinine and uric acid levels. This may be due to the presence of polyphenols and flavonoids in thyme might be responsible for the antioxidant activities and the reduction of serum creatinine and uric acid levels. It may be also reported that biochemical results may indicate a possible synergistic action when two studied herbs combined.

Table (1): Effect of thyme and basil leaves powder and their mixture on body weight gain, feed intake and feed efficiency ratio of obese rats

Treatment/Parameters	BWG (g/28day)	FI (g/day)	FER
	M ± SD	M ± SD	M ± SD
Control group (-)	19.80±0.11^{d}	19.70±1.24^{d}	0.036± 0.002^{f}
Control group (+)	55.63±0.32^{a}	28.03±1.23^{a}	0.071±0.004^{a}
Obese rats with 2.5 % thyme	47.12±0.11^{b}	26.45±1.10^{b}	0.064± 0.001^{c}
Obese rats with 5 % thyme	44.34±0.50^{b}	25.54±1.25^{b}	0.062±0.002^{d}
Obese rats with 2.5 % basil	40.30±0.61^{c}	25.00±1.12^{b}	0.058±0.003^{e}
Obese rats with 5 % basil	39.06±0.12^{c}	21.45±1.31^{c}	0.065±0.005^{c}
Obese rats with 2.5% mixtures	46.65±0.12^{b}	25.51±1.25^{b}	0.068±0.003^{b}
Obese rats with 5%mixtures	53.22±0.61^{a}	26.42±1.23^{b}	0.072±0.005^{a}
LSD	**3.34**	**1.46**	**0.02**

Each value is represented as mean ± standard deviation.

Mean under the same column bearing different superscript letters are different significantly ($p < 0.05$).

Table (2): Effect of thyme and basil leaves and their mixture at different levels on GPT and GOT of obese rats

Treatment/Parameter	Liver functions	
	GPT (U/L)	GOT (U/L)
	M ± SD	M ± SD
Control group (-)	43.50± 0.10^{g}	33.50± 0.10^{f}
Control group (+)	107.00±0.14^{a}	72.50± 0.10^{a}
Obese rats with 2.5 %thyme	75.00±0.16^{c}	54.50± 0.10^{c}
Obese rats with 5 % thyme	55.50±0.11^{d}	50.50± 0.10^{d}
Obese rats with 2.5 % basil	81.50±0.12^{b}	61.50± 0.10^{b}
Obese rats with 5 % basil	73.50±0.22^{c}	63.00± 0.10^{b}
Obese rats with 2.5% mixtures	51.50±0.20^{e}	46.50± 0.10^{e}
Obese rats with 5% mixtures	48.00±0.14^{f}	44.00± 0.10^{e}
LSD(P ... 0.05)	**2.12**	**2.84**

Each value is represented as mean ± standard deviation (n = 3).
Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).

Table (3): Effect of thyme and basil leaves powder and their mixture at different levels on total cholesterol and triglyceride levels of obese rats

Treatment/Parameters	Total cholesterol (mg/dl)	Triglyceride (mg/dl)
	M ± SD	M ± SD
Control group (-)	109.5± 0.14^{f}	37.50± 0.10^{f}
Control group (+)	150.0±0.10^{a}	91.50± 0.13^{a}
Obese rats with 2.5 % thyme	103.50±0.15^{b}	83.50± 0.12^{b}
Obese rats with 5 % thyme	97.50±0.13^{d}	79.00± 0.14^{c}
Obese rats with 2.5 % basil	100.50±0.16^{c}	83.00± 0.12^{b}
Obese rats with 5 % basil	93.50±0.20^{e}	76.50± 0.15^{d}
Obese rats with 2.5% mixtures	74.50±0.20^{f}	79.50± 0.13^{c}
Obese rats with 5% mixtures	69.00±0.12^{g}	63.50± 0.10^{e}
LSD	**1.46**	**1.66**

Each value is represented as mean ± standard deviation.
Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).

Table (4): Effect of thyme and basil leaves and their mixture at different levels on lipid profile of obese rats

Treatment/Parameters	HDL-c (g/dl)	LDL-c (g/dl)	VLDL-c (g/dl)
	M ± SD	M ± SD	M ± SD
Control group (-)	67.00±0.16[a]	35.00±0.25 [d]	7.50±0.14[e]
Control group (+)	32.50± 0.14[g]	64.70±0.13[a]	18.30±0.12[a]
Obese rats with 2.5 % thyme	48.50±0.13 [c]	38.30±0.12[c]	16.70±0.13[b]
Obese rats with 5 % thyme	50.50±0.10 [b]	31.20±0.13[e]	15.80±0.14[b]
Obese rats with 2.5 % basil	42.50±0.20 [d]	41.40±0.14 [b]	16.60±0.10[b]
Obese rats with 5 % basil	39.57±0.21 [e]	38.63±0.11[c]	15.30±0.12 [c]
Obese rats with 2.5% mixtures	36.70±0.10 [f]	21.90±0.13[g]	15.90±0.21[b]
Obese rats with 5%mixtures	32.50±0.15 [g]	23.80±0.23[f]	12.70±0.11[d]
LSD(P ... 0. 05)	**1.01**	**1.03**	**0.98**

Each value is represented as mean ± standard deviation.

Mean under the same column bearing different superscript letters are different significantly ($p \leq 0.05$).

Table (5): Effect of thyme and basil leaves powder and their mixture at different levels on kidney function of obese rats

Treatment/Parameters	uric acid (mg/dl)	Urea (mg/dl)	Creatinine (mg/dl)
	M ± SD	M ± SD	M ± SD
Control group (-)	5.00± 0.11[d]	28.00±0.21[f]	0.78±0.01[c]
Control group (+)	9.00±0.14[a]	55.00±0.12[a]	1.85±0.03[a]
Obese rats with 2.5 % thyme	7.95±0.14 [b]	40.50±0.12[b]	0.95±0.02[b]
Obese rats with 5 % thyme	6.40±0.11[c]	34.00±0.15[c]	1.09±0.01[b]
Obese rats with 2.5 % basil	7.85±0.21[b]	36.50±0.16 [c]	1.13±0.02[b]
Obese rats with 5 % basil	6.80±0.14[c]	30.00±0.20[e]	1.05±0.01[b]
Obese rats with 2.5% mixtures	6.10±0.10[c]	33.00±0.14[d]	0.86±0.02[c]
Obese rats with 5%mixtures	5.25±0.13[d]	29.50±0.24[f]	0.84±0.01[c]
LSD	**0.84**	**2.10**	**0.25**

Each value is represented as mean ± standard deviation.

Mean under the same column bearing different superscript letters are different significantly ($p < 0.05$).

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تأثير أوراق الريحان والزعتر على التغيرات البيولوجية والكيموحيوية فى الفئران المصابة بالسمنة

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الملخص العربى

هدفت الدراسة الحالية إلى تقييم تأثير إضافة التركيزات المختلفة (٢,٥,٥٪) لمسحوق الريحان والزعتر ومخلوطهما على التغيرات البيولوجية والكيموحيوية وكمضاد للسمنة لدى الفئران البدينة. ٤٨ من ذكور الفئران البيضاء البالغة التي يبلغ وزنها ١٤٠ ±١٠ جم قسمت عشوائيا إلى ٨ مجموعات (٦ فئران بكل منها) وتم تغذيتهم على الوجبة القياسية . تم معاملة السبع مجموعات الاخرى عن طريق اتباع نظام غذائي عالي الدهون (٢٠٪ من الدهون الحيوانية) للحث على السمنة. وقد أظهرت النتائج أن أعلى نسبة زيادة لوزن الجسم وكفاءة التغذية مسجلة لمخلوط (٥٪) من مسحوق أوراق الزعتر والريحان ، في حين سجلت أقل نسبة لزيادة وزن الجسم وكمية الغذاء المتناول لمسحوق أوراق الريحان (٥٪). أعلى كمية الغذاء المتناول مسجلة ايضا لـ (٢,٥٪) من مسحوق أوراق الزعتر. سجلت أقل نسبة GOT وGPT مخاليط من أوراق الزعتر والريحان (٥٪) مع اختلاف كبير. أقل مستويات الكوليسترول والدهون الثلاثية المسجلة للمجموعات التي يتم تغذيتها على (٥٪) من خليط الزعتر وأوراق الريحان مع وجود فرق معنوى. أعلى مستويات (HDL-c) المسجلة للمجموعة التي يتم تغذيتها على أوراق الزعتر (٥٪) ، بينما سجلت المستويات الأقل (LDL-c) للمجموعات التي يتم تغذيتها على (٢,٥٪) من خليط الزعتر وأوراق الريحان. أدنى (VLDL-c) المسجلة للمجموعات التي يتم تغذيتها على (٥٪) مخاليط من أوراق الزعتر والريحان. أدنى حمض يوريك ، واليوريا ، والكرياتينين مسجلة لمجموعة تتغذى على (٥٪) مخلوط من أوراق الزعتر والريحان مع اختلاف كبير. في الختام ، فإن الفئران السمنة التي تم معاملتها بمخلوط (٥٪) من أوراق الزعتر والريحان كان لها تحسن في وظائف الدهون والكبد والكلى مقارنة بأوراق الزعتر والريحان كلا على حده.

الكلمات الافتتاحية: أوراق الأعشاب- الفئران - التأثير المضاد للسمنة - التحاليل الكيميائية الحيوية .