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Effects of some vegetables on rats fed diet inducing obesity

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Abstract

The aim of work is to study the effect of three vegetables (turnip roots, swiss chard leaves and cabbage leaves) on weight gain performance and serum lipid profile of rats.Eight groups of normal rats (six each) were assigned for one of the following diets: basal diet (10% protein % 20% fat) as control and seven basal diets supplemented with dry vegetables (three with one vegetable at 5% level; three with two vegetables at 4.5% each; and one with the three vegetables at 3% each). All groups were fed for eight weeks, body weight gain, deposit fat and food intake were recorded, and serum lipid profile (total lipid, triglycerides, total cholesterol, LDL- cholesterol & HDL-cholesterol) were measured. Body weight gain for all experimental animal groups was increased, but the increase was significantly higher in control group than all tested groups. The least increase in weight was recorded for group fed on turnip roots diet. Fat deposit tissue recorded similar trend as gain in body weight. Turnip, Swiss chard and cabbage containing diets generally had significantly lower values for serum total lipids, triglycerides, total cholesterol and LDL-cholesterol and higher values for HDL-cholesterol than control diet fed group. It was concluded that turnip roots, swiss leaves and cabbage leaves have benefits for rats fed diet inducing obesity through reduction of relative body weight gain, fat deposit tissue and serum lipids.

Introduction

Millions of adults were overweight or obese, which puts them at increased risk of hypertension, dyslipidemia, type 2 diabetes, heart disease, blood pressure and many other chronic disorders ***(Eckel and Krauss 1998, National Institute of Health, 1998, Kuczmarski et al., 1997, NHLBI 1998& Golditz et al.,1995).*** Yet, the long-term efficacy of any specific dietary approach to weight control remains to be determined ***(Liu and Manson 2001, WHO 1998 & Willett 1998).*** Because of the belief that diets rich in fiber are generally low in saturated fat, many national authorities have recommended greater consumption of fibers to control weight ***(Liu et al.,2003, Krauss et al., 2000, US Department of Agriculture. 2000& US Department of Health and Human Services 2000).***

Some studies showed that an increase in consumption of vegetables over time was associated with a decrease in body weight ***(Epstein et al., 2001, John et al., 2002 & Smith-***

warner et al., 2000). After five weeks of feeding rats with a standard diet containing cabbage extracts (1mg dried extract/ g food), plasma triacylglycerol levels were significantly decreased, while plasma HDL-cholesterol levels were increased. Also there was a significant decrease in the atherogenicity index, a significant decrease in liver triacylglycerol, and a significant increase in the molar ratio of phospholipids : cholesterol in the erythrocytes and the aortal wall of treated rats, compared with control rats (fed diet devoid of cabbage extract) ***(Jahdodar et al.,1995).*** Diets containing rape (turnip) and swiss chard can increase the concentration of serum Mg in cattle and may be helpful in the prevention of grass tetany (Higgins et al.,1988). Nutrients in wild swiss chard leaves are higher in concentrations than in commercially exploited cultivate. Turnip has high content of polyunsaturated fatty acids ***(Makarenko et al.,1999).*** Turnip juice is a fermented traditional popular and healthy Turkish soft drink ***(Ozhan&Coksoyler 2005).***

The aim of this research is to study the effects of turnip root, swiss chard leaves and cabbage leaves on the weight performance and the serum lipid profile of rats.

Materials and Methods

Raw materials and preparation:

Turnip roots (Brassica campestris var. rapa), swiss chard leaves (Beta vulgaris var. cicla.) and cabbage leaves (Brassica oleracea var. capitata.) were obtained from local market in Giza. Turnip, swiss chard and cabbage were washed, cut into small pieces and dried at 60°C over night then, milled using laboratory mill. The dried powder were kept frozen until use.

Animals and diets:

Fourty eight female albino rats (Wistare strain) of 5 weeks old and an average weight.83g were used. They were divided into eight groups each of six rats. The animals were housed individually in stainless steel cages in animal room. Fresh diets high in fat (20%) were given to the animals daily. Food and water were provided at libitum for eight weeks. Food intake was measured daily and body weight was recorded weekly. Composition of the control and experimental diets is shown in table (1).

Sample collection and chemical assay:

Blood was collected every two weeks from the eye plexuses by a fine capillary glass tubes. After clotting, the blood was centrifuged at 1300xg for 10min, serum was collected and kept in a deep freezer until analysis. At the end of the experiment adipose tissue which surrounds kidneys, liver, heart and ovaries were collected. Liver, spleen, kidneys, ovaries and adipose tissue were washed in cold saline solution and weighed. Serum cholesterol, triglycerides, HDL-cholesterol and LDL-cholesterol were measured using biochemical assay kit (Stanbio laboratory TX USA), as

previously described by ***Allain et al., (1974),*** Fossati and ***Precipe (1982),*** Lopez-***Virella et al (1977) and Glatter (1984)*** respectively. Serum total lipid concentration was determined according to ***Chabrol and Charonnat (1937).***

Statistical analysis:

Data were collected in special forms and were analyzed statistically by student's t-test and ANOVA using ***(SPSS package, 1990).***

Results

The chemical composition of cabbage, swiss chard and turnip are shown in table (2). It is clear that the highest content of protein is in turnip and the lowest content of fat is in cabbage. Fiber contents are the same in cabbage, swiss chard and turnip. The table also shows that the highest contents of iron, zinc and potassium is in swiss chard, whereas the highest content of calcium is in turnip. These results are in agreement with those reported by ***Bowes and Church(1983)*** , Food Comp. Tables in Middle East ***(1963)& Komaitis and Panagiotou.,(1990).***

Table (3) indicates that feeding of rats with diet that contained turnip alone leads to significant decrease ($p \leq 0.05$) in weight gain after eight weeks compared to the other groups of rats. The mean final gain in body weights were significantly different ($p \leq 0.05$) in all groups compared to the control group.

Table (4) show that the serum cholesterol levels decreased significantly in rats fed supplemented diets with turnip, swiss chard, cabbage or blends of these vegetable compared to the control group. Data from table (5) show significant lower values ($p \leq 0.05$) in serum triglycerides of all groups of rats compared to the control. The lowest concentration of total lipids was found in the serum of rats diet contains 5% turnip or 5% swiss chard as compared with the other groups and the difference was significant ($p<0.05$) (table 6). Rats fed diets supplemented with turnip, swiss chard, cabbage and mixtures of any of these vegetable had significantly higher values of serum HDL-cholesterol compared with the control. The lowest concentration of LDL-cholesterol was found in the serum of rats fed diet that contained 5% turnip (table 7).

The relative weights and adipose tissue decreased significantly in all groups of rats compared to the control group (table 8). The relative liver weight of rats fed 5% turnip was significantly decreased as compared to control group (table 8). The highest significant increase in the relative weights of spleen and kidneys were found in the rats fed 5% cabbage. The group of rats fed 5% turnip or 5% swiss chard for eight weeks (Table8) showed the lowest significant relative weights in their ovaries compared with the control group.

Discussion

The prevalence of obesity has increased substantially in the world during the past decade and continues to rise ***(Flegal et al., 1998).*** Obesity is a chronic disease and major independent risk factor for cardiovascular disease ***(Eckel& Krauss 1998).*** The study was planned to investigate the effects of vegetables added to high fat diet (20%) and provide almost 460 Kcal/100g, in reducing the expected weight gain and lipid profile of experimental animals. The present study showed that feeding rats with diets containing dry turnip roots, swiss chard and cabbage leaves caused a relative reduction in body weight gains and adipose tissue compared with those fed control diet. These results are in agreement with those reported by ***Rashad & Moharib (2003)*** who studied the effect of turnip, cabbage and other green leaves on nutritional parameters and lipid metabolism in rats fed for 8 weeks comparing with a control diet. A weight loss of 5-10% of initial body weight improved obesity related risk factors, including lipid concentrations and glycemic control ***(Goldstein 1992, Hill et al.,1999 & Pi-Sunyer 1993).***

In this study we noticed a significant reduction in serum cholesterol level of rats fed diets supplemented with turnip and cabbage. This is in accordance with those of Igarashi et al.,1997, Komatsu et al., 1998, Jahdodar et al., 1995, Metwalli et al.,1993& Rashad and Moharib 2003.

Serum triglycerides decreased significantly in rats fed diets supplemented with turnip or cabbage as compared to those fed control diet ***(Bakry 2002& Rashad and Moharib 2003).*** The present data showed that total lipid concentrations were reduced significantly in serum of rats fed diets supplemented with turnip, swiss chard and cabbage as compared to the control rats.

Rashad&Moharib (2003) observed that there was a significant decrease in serum total lipids level of rats fed diet containing cabbage for 8 weeks.

In the present study HDL-cholesterol level was elevated whereas LDL-cholesterol level was decreased significantly after eight weeks in the rats fed diets containing turnip, swiss chard and cabbage or mixture of them. ***Jahdodar et al., (1995)*** in their study concluded that plasma HDL-cholesterol levels were significantly increased in hypercholesterolemic rats after 5 weeks of feeding with a standard diet containing cabbage extracts (1mg dried extract/g food).The effects of anthocyanine of red turnip on serum high density lipoprotein (HDL- cholesterol) and low density lipoprotein (LDL -cholesterol) were examined in rats fed for 3 weeks on either a control diet based on lard-cholesterol or experimental diets containing anthocyanine isolated from turnip roots; HDL-cholesterol levels were increased significantly and LDL-cholesterol were decreased significantly in serum of rats fed the experimental diets compared with rats fed the control diet (Igarashi et

al.,1990). HDL-cholesterol / total cholesterol ratio increased significantly when rats fed diet containing cabbage ***(Metwalli et al.,1993).***

Turnip roots contains anthocyanins as cyanidin-3,5 diglucoside and cyanidin-3 monoglucoside which plays a great role in reduction of serum lipids ***(Igarashi et al., 1990).*** S-methyl-L-cysteine sulfoxide, a component of cabbage is one of the factors that suppresses hypercholesterolemia in the hepatoma-bearing rats ***(komatsu et al., 1998).*** Indirect evidence from both epidemiologic and short-term experimental studies suggested a beneficial role of a high fiber diet in weight control ***(Liu 2002).*** Dietary patterns play an important role in the control of body weight. Such specific eating patterns could help in reducing the rate of weight gain ***(Drapeau et al.,2004).***

In conclusion; the demonstrated results showed that adding dry form of vegetables (turnip roots, swiss chard leaves, and cabbage leaves) can reduce the harmful effects of high lipid diet on weight gain and deposit fat as well serum lipid profile (total lipids, total cholesterol, triglycerides, HDL-cholesterol & LDL-cholesterol) which may be due to the effect of different vegetables components.

Table (1): Composition of control and experimental diets

Constituents of diet (g)	Group1 (cotrol)	Group2	Group3	Group4	Group5	Group6	Group7	Group8
Casein	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Starch	56.2	47.2	47.2	47.2	47.2	51.2	51.2	51.2
Sunflower oil	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vegetable samna	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Cellulose	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Salt mix.	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vit. Mix.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Swiss chard leaves	---	3.0	4.5	4.5	---	---	5.0	---
Turnip roots	---	3.0	4.5	---	4.5	5.0	---	---
Cabbage leaves	---	3.0	---	4.5	4.5	---	---	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table (2): Chemical composition of cabbage, swiss chard and turnip (per 100g on dry weight basis)

Composition	Cabbage leaves	Swiss chard leaves	Turnip roots
Protein (g)	17.10	25.26	29.88
Fat (g)	2.63	3.15	3.44
Carbohydrates	57.89	48.4	48.27
Crude fiber (g)	13.15	10.52	9.20
Ash (g)	9.2	12.63	9.20
Energy (Kcal)	323	323	343.6
Fe (mg)	5.26	33.6	20.68
Zn (mg)	2.67	4.21	1.14
Ca (mg)	644	1052	2827
K (mg)	3065	5789	2068

Table (3): Weight, weight gain and food consumption of rats fed experimental diets.

Groups	Initial body weight (g)	Final body weight (g)	Total weight gain (g)	Weight gain %	Food intake (g/d)
Group 1 Control	82.33±1.20^{ba}	201.67±1.45^{a}	119.33±0.88^{a}	145.03±2.43^{a}	17.10±0.23^{e}
Group2 Turnip + swiss chard + cabbage	82.00±1.16 ^{ba}	170.67±1.20^{dc}	88.66±1.45^{c}	108.20±2.90^{cb}	18.73±0.09^{bc}
Group3 Turnip+ swiss chard	83.66±0.88^{a}	179.67±0.88^{b}	96.00±1.53^{b}	114.80±2.95^{b}	18.90±0.06^{ba}
Group4 swiss chard + cabbage	84.00±1.15^{a}	174.66±1.20^{c}	90.66±0.88^{c}	107.97±2.12^{cb}	18.37±0.28^{d}
Group5 Turnip + cabbage	83.33±0.88^{a}	169.66±0.88^{d}	86.33±2.33^{d}	103.67±3.24^{c}	18.57±0.23^{dc}
Group6 Turnip	84.66±0.33^{a}	129.33±1.20^{e}	44.67±0.88^{e}	52.73±0.84^{d}	19.23±0.09^{a}
Group7 Swiss chard	82.00±0.58^{b}	170.33±1.2^{dc}	88.33±0.88^{d}	107.73±1.11^{c}	16.80±0.12^{e}
Group8 Cabbage	80.33±0.88^{b}	170.33±1.76^{d}	90.00±2.08^{c}	111.20±3.96^{cb}	18.10±0.17^{d}

Mean ± SE

Values followed by the same letter within the same column were not significantly different (P≤0.05).

Table (4): The effect of turnip, swiss chard and cabbage on serum cholesterol of rats(mg/dl)

Groups	week				
	Second	Forth	Sixth	Eighth	Initial
Group 1 Control	63.60±0.64^{a}	87.86±0.62^{a}	98.33±0.47^{a}	124.63±0.47^{a}	50.35± .69^{ba}
Group2 Turnip + swiss chard + cabbage	52.25±0.54^{de}	63.75±0.69^{c}	74.61±0.40^{c}	83.23±0.44^{c}	49.62±0.70^{ba}
Group3 Turnip + swiss chard	54.36±0.78^{cd}	66.32±0.52^{b}	77.17±0.51^{b}	85.74±0.52^{b}	51.27±0.64^{ba}
Group4 swiss chard + cabbage	53.53±0.74^{cd}	62.85±0.52^{dc}	72.67±0.37^{d}	80.82±0.34^{d}	50.63±0.46^{ba}
Group5 Turnip +cabbage	53.67±0.41^{cd}	61.13±0.42^{de}	70.37±0.79^{e}	79.39±0.61^{ed}	51.44±0.74^{a}
Group6 Turnip	52.60±0.75^{de}	58.57±0.86^{f}	66.74±0.61^{g}	74.69±0.50^{f}	50.83±0.60^{ba}
Group7 Swiss chard	51.55±0.79^{e}	59.33±0.72^{fe}	68.70±0.44^{f}	78.16±0.28^{e}	49.37±0.69^{b}
Group8 Cabbage	56.25±0.48^{b}	67.74±0.53^{b}	78.16±0.69^{b}	87.15±0.64^{b}	50.84±0.53^{ba}

Mean ± SE

Values followed by the same letter within the same column were not significantly different (P≤0.05).

L.S.D. between any two periods (week) = 2.45 at 0.05 level significant.

Table (5): The effect of turnip, swiss chard and cabbage on serum triglycerides of rat (mg/dl)

Groups	week				
	Initial	Second	Forth	Sixth	Eighth
Group 1 Control	60.52±0.40^{ba}	84.84±0.53^{a}	100.97±0.47^{a}	121.61±0.55^{a}	145.40±0.34^{a}
Group2 Turnip+ swiss chard + cabbage	62.15±0.66^{a}	72.62±0.37^{b}	78.99±0.04^{c}	85.18±0.58^{d}	92.42±0.70^{e}
Group3 Turnip+ swiss chard	60.85±0.53^{ba}	68.47±0.47^{de}	78.82±0.51^{c}	90.34±0.47^{b}	99.84±0.51^{c}
Group4 swiss chard + cabbage	60.43±0.70^{ba}	67.23±0.46^{fe}	78.15±0.68^{c}	88.40±0.58^{c}	95.19±0.57^{d}
Group5 Turnip+cabbage	59.63±0.70^{b}	69.25±0.54^{c}	75.26±0.51^{d}	80.22±0.62^{e}	85.71±0.47^{f}
Group6 Turnip	61.47±0.40^{ba}	66.57±0.68^{f}	70.14±0.66^{f}	74.74±0.45^{g}	78.61±0.40^{h}
Group7 Swiss chard	62.34±0.54^{a}	67.58±0.69^{fe}	72.46±0.68^{e}	78.21±0.38^{f}	81.55±0.74^{g}
Group8 Cabbage	59.77±1.00^{b}	69.17±0.55^{dc}	80.63±0.41^{b}	91.73±0.67^{b}	102.21±0.64^{b}

Mean ± SE

Values followed by the same letter within the same column were not significantly different (P≤0.05).

L.S.D. between any two periods (week) = 2.16at 0.05 level significant.

Table (6): The effect of turnip, swiss chard and cabbage on serum total lipids of rat (g/L)

Groups	week				
	Initial	Second	Forth	Sixth	Eighth
Group 1 Control	2.61±0.06^{a}	3.45±0.04^{a}	3.97±0.07^{a}	4.31±0.06^{a}	4.72±0.05^{a}
Group2 Turnip+ swiss chard + cabbage	2.72±0.06^{a}	2.94±0.05^{c}	3.17±0.05^{c}	3.49±0.05^{c}	3.66±0.05^{d}
Group3 Turnip+ swiss chard	2.68±0.05^{a}	3.16±0.04^{b}	3.38±0.06^{cb}	3.86±0.07^{b}	4.21±0.05^{b}
Group4 swiss chard + cabbage	2.67±0.06^{a}	3.38±0.27^{a}	3.29±0.06^{cb}	3.65±0.04^{c}	3.95±0.08^{c}
Group5 Turnip+cabbage	2.64±0.07^{a}	2.78±0.05^{c}	3.30±0.28^{cb}	3.15±0.07^{d}	3.27±0.05^{e}
Group6 Turnip	2.63±0.05^{a}	2.71±0.06^{c}	2.79±0.06^{d}	2.84±0.07^{e}	2.83±0.05^{f}
Group7 Swiss chard	2.75±0.03^{a}	2.75±0.07^{c}	2.82±0.06^{d}	2.93±0.04^{e}	2.97±0.05^{f}
Group8 Cabbage	2.65±0.07^{a}	2.97±0.06^{bc}	3.61±0.05^{b}	3.94±0.07^{b}	4.19±0.06^{b}

Mean ± SE

Values followed by the same letter within the same column were not significantly different (P≤0.05).

L.S.D. between any two periods (week) = 0.42at 0.05 level significant.

Table (7): HDL-cholesterol and LDL-cholesterol (mg/ dl) on serum of rats fed experimental diets for 8 week

	Group 1 Control	Group2 Turnip+ swiss chard + cabbage	Group3 Turnip+ swiss chard	Group4 swiss chard + cabbage	Group5 Turnip+ cabbage	Group6 Turnip	Group7 Swiss chard	Group8 Cabbage
HDL-cholesterol	44.32± 0.44^{h}	54.32± 0.47^{d}	50.38± 0.45^{f}	52.45± 0.48^{e}	57.37± 0.46^{c}	61.44± 0.38^{a}	59.51± 0.37^{b}	48.42± 0.42^{g}
LDL-cholesterol	47.80± 0.64^{a}	37.47± 0.76^{d}	43.39± 0.60^{b}	40.56± 0.42^{c}	34.35± 0.47^{e}	28.37± 0.61^{g}	31.38± 0.49^{f}	43.58± 0.61^{b}

Mean ± SE

Values followed by the same letter within the same raw were not significantly different (P≤0.05).

Table (8): Relative weights of adipose tissue, liver, spleen, kidneys and ovaries (g/100g body weight).

Groups	Adipose tissue	Liver	Spleen	Kidneys	Ovaries
Group 1 Control	2.29 ± 0.01^{a}	3.83 ± 0.05^{a}	0.22 ± 0.01^{b}	0.86 ± 0.01^{c}	0.12 ± 0.01^{a}
Group2 Turnip+ swiss chard + cabbage	1.57 ± 0.01^{e}	2.82 ± 0.06^{dc}	0.20 ± 0.01^{c}	0.82 ± 0.10^{d}	0.05 ± 0.01^{d}
Group3 Turnip+ swiss chard	1.91 ± 0.01^{c}	3.13 ± 0.06^{b}	0.20 ± 0.01^{c}	0.79 ± 0.01^{ed}	0.06 ± 0.01^{d}
Group4 swiss chard + cabbage	1.82 ± 0.01^{d}	2.91 ± 0.06^{c}	0.22 ± 0.00^{cb}	0.76 ± 0.01^{e}	0.09 ± 0.01^{bc}
Group5 Turnip+cabbage	1.54 ± 0.01^{e}	2.73 ± 0.06^{dc}	0.20 ± 0.01^{c}	0.82 ± 0.01^{d}	0.10 ± 0.01^{ba}
roup6 Turnip	1.02 ± 0.07^{g}	2.43 ± 0.07^{e}	0.12 ± 0.01^{e}	0.93 ± 0.02^{b}	0.02 ± 0.01^{e}
Group7 Swiss chard	1.42 ± 0.01^{f}	2.66 ± 0.06^{d}	0.15 ± 0.01^{d}	0.88 ± 0.01^{c}	0.02 ± 0.01^{e}
Group8 Cabbage	2.01 ± 0.01^{b}	3.65 ± 0.08^{a}	0.24 ± 0.01^{a}	0.98 ± 0.01^{a}	0.07 ± 0.01^{dc}

Mean ± SE

Values followed by the same letter within the same column were not significantly different ($P\leq0.05$).

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تأثير بعض الخضر على فئران تتغذى على وجبة مسببة للسمنة

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الملخص العربى

الهدف من البحث هو دراسة تأثير ثلاثة أنواع من الخضر وهى جذور اللفت وورق السلق وورق الكرنب على وزن الفئران وكذلك على ليبيدات السيرم .تم تحديد ثمانية مجاميع من الفئران كل مجموعة بها ستة فئران وغذيت على وجبات كالتالى :الوجبة الأساسية)تحتوى على ١٠٪ بروتين ، ٢٠٪ دهن (وهى الوجبة الضابطة بالإضافة إلى سبعة وجبات أخرى تحتوى على الخضر الجافة)ثلاثة وجبات تحتوى كل منها على نسبة ٥٪ من نوع واحد من الخضر .وثلاثة وجبات تحتوى كل منها على نوعين من الخضر كل منهما بنسبة ٤,٥ .%ووجبة واحدة تحتوى على ثلاثة خضروات بنسبة ٣٪ من كل منها.(

تم تغذية كل مجاميع الفئران لمدة ثمانية أسابيع وتم تسجيل وزن الجسم ووزن الغذاء المتناول ووزن الدهون المتراكمة .كذلك تم قياس مستوى ليبيدات السيرم)الدهون الكلية –الجلسريدات الثلاثية -الكوليسترول الكلى -الليبوبروتينات المنخفضة الكثافة –الليبوبروتينات المرتفعة الكثافة.(

زاد وزن الجسم لكل مجاميع الحيوانات المختبرة ولكن أعلى زيادة معنوية فى الوزن كانت للمجموعة الضابطة بالمقارنة بالمجاميع الأخرى . وأقل زيادة فى الوزن كانت للمجموعة التى تتغذى على جذور اللفت .وسجلت الدهون المتراكمة نفس نتائج الزيادة فى وزن الجسم .عموما الوجبات التى تحتوى على اللفت والسلق والكرنب أدت إلى إنخفاض معنوى فى قيم الدهون الكلية للسيرم والجلسريدات الثلاثية والكوليسترول الكلى والليبوبروتينات منخفضة الكثافة .كما أدت إلى زيادة معنوية لقيم الليبوبروتينات مرتفعة الكثافة وذلك بالمقارنة بالمجموعة التى تتغذى على الوجبة الضابطة.

نستخلص من النتائج أن جذور اللفت وورق السلق وورق الكرنب لها مزايا للفئران التى تتغذى على وجبة مسببة للسمنة عن طريق خفض وزن الجسم وكذلك الدهون المتراكمة وايضا خفض مستوى ليبيدات السيرم.