Introduction

Obesity is a social problem with established links to adverse health outcomes, such as hypertension, hyperlipidemia and insulin resistance. As reported by world health organization at least 2.8 million adults die annually because of being overweight or obese. Thus, health organizations are giving significant attention to this problem **(Al-Faris, 2014).** In Egypt a report was done by **(National Nutrition institute, 2004)** Indicated that an increasing prevalence of obesity among children and adolescents reaching 5.8% among males and 9.7% among females. It is defined by an excessive accumulation of body fat content which according to its magnitude and anatomical distribution is related to health risks affecting life expectancy and quality of life **(Moreno, 2012).**

The world health organization (WHO) defines obesity as an excess in fat mass great enough to increase the risk of morbidity, altered physical, physiological, or social well-being and/or mortality. A more clinically oriented definition describes obesity as an inflammation of body fat mass affecting health. As such, obesity can be interpreted as failure of the body systems using external and /or internal input to regulate energy reserves **(Ke^ke^ et al., 2015).**

Given that nowadays use of traditional medicine and medicinal plants has become prevalent in the treatment of many diseases. Using of medicinal plants can be a viable alternative for synthetic drugs. Extensive studies have been performed on the effects of different medicinal plants on plasma lipids and weight loss **(Zare et al., 2014).**

Alchemilla vulgaris L. (lady's mantle or lion leg) is an herb. The parts that grow above the ground are used to make

medicine. Alchemilla is used for stomach problems, mild diarrhea, diabetes, water retention,swelling (inflammation), and muscle spasms. Some people use it as a gargle for sore mouth and throat. Women use *Alchemilla* for heavy or painful menstrual periods or for symptoms of menopause. Some people apply *Alchemilla* directly to the skin to stop bleeding; improve wound healing; or treat ulcers, eczema, or skin rashes. *Alchemilla vulgaris L.* (lady's mantle or lion leg) is regarded as safe by the German Commission even at large doses without known adverse effects **(Blumenthal et al.,1999)**.Deeply rooted in Arabic medicine, *A. vulgaris L*. has been used for treating gastrointestinal pain and inflammation **(Said et al., 2002)**.

Senna (*Cassia senna L*) plant is a small shrub belonging to the Caesalpiniaceae family. Incidentally, the senna belongs to two genus of (*Cassia- C*). senna also known as Alexandrina senna. Senna is used in the treatment of constipation, working through a stimulation of intestinal peristalsis. Aid the body in cleannig waste. Adverse Reactions of Senna may cause diarrhea, loss of fluids, hypokalemia, and abdominal pain/cramping if it used at high dose. Senna leaves have been used as a stimulant laxative at dosages of 0.6 to 2 g/day. **(Balasankar et al., 2013)**.

Sage (*Salvia Officinalis*) has one of the longest histories of use of any culinary or medicinal herb. Sage has been used for centuries as a spice and seasoning in cooking or traditional remedy for coughs, sore mouths and throats. Sage was used as a fertility drug in ancient Egypt. Physicians in ancient Greece used a solution of sage and water to stop wounds from bleeding and to clean sores and ulcers. Sage is used as traditional remedy for inflammation, indigestion, and excessive sweating; to improve mood; and

to boost memory or mental performance. Sage is available as dried leaves, liquid extracts, and essential oils **(Blumenthal et al.., 2000)**.

The present work was conducted to study the effect of Sage (*Salvia Officinalis L.*) , lion's foot (*Alchemilla vulgaris L.*) and Senna (*Cassia senna L.*) on weight loss, lipids profile, liver functions, serum glucose and leptin hormone of obese rats fed on high fat diet.

Materials and methods

Materials:-

- **Chemicals:** vitamins, mixture, choline Bitartrate and L-cysteine were obtained from the Cairo company for chemicals trading, Cairo, Egypt. Casein, minerals and cellulose were purchased from El-Gomhoria company Cairo, Egypt.
- **Animals:** Sixty of adult male albino rats (Sprague-Dawley strain) weighted approximately (200±10 g) were purchased from experimental animals station, Agricultural research center, Giza, Egypt.
- **Starch** was obtained from the Egyptian starch and glucose, mostorod factory, Qalyubia, Egypt. Corn oil, beef tallow and sucrose were obtained from local market.
- **Herbs**: Lion leg, Senna and Sage powdered were obtained from Haraz , bab El-khalq,Cairo, Egypt .
- **Kits** for blood analysis were purchased from gamma trade company for chemicals, Cairo, Egypt.

Methods:-

Induction of obesity, diet composition and experimental animal design:

This study was carried out at the animal house of the faculty of Home Economics, Helwan University .Sixty adult male albino rats Sprague-Dawley strain (200±10g) were housed in well aerated cages under hygienic conditions and fed on basal diet for one week for adaptation. After a period of adaptation on basal diet (one week), the rats (n=60) were divided into two main groups, the first main group (n=6 rats) fed on basal diet and kept as a control negative group. The second main group(n=54 rats) received high fat diet for 4 weeks to induce obesity in rats, the high fat diet consisted of 20% fat (19% beef tallow and 1% corn oil to provide essential fatty acids) according to **(Min et al., 2004)**, 14 % protein from casein (≥ 80 %), 0. 25 % choline chloride, 1 % vitamin mixture, 3.5% salt mixture, 5 % cellulose, 0.18 % L – cysteine and the remainder is corn starch **(Reeves et al ., 1993).**

Then the high fat diet group was divided into nine subgroups (n=6 rats for each), the first subgroup fed on high fat diet as a control positive group. The second and third subgroups fed on high fat diet supplemented with 2% and 4% lion leg, respectively. The fourth and fifth subgroups received high fat diet supplemented with 2% and 4% Sage, respectively. The sixth and seventh subgroups fed on high fat diet supplemented 2% and 4% Senna, respectively. Eighth subgroup was fed on high fat diet supplemented with low mix of (1% lion leg, 1% Sage and 0.25% Senna). The last subgroup received high fat diet supplemented with high mix of (2% lion leg, 2% Sage and 0.5% Senna).

During the experimental period (8 weeks), the diets consumed and body weights were recorded twice weekly. At the end of the experiment, the animals were fasted overnight, then the rats were weighed, anaesthetized and

sacrificed, then blood samples were collected from the aorta. The blood samples were centrifuged and serum was separated to estimate some biochemical parameters, i.e. serum cholesterol **(Allain et al., 1974),** triglycerides **(Foster and Dumns., 1973)**, HDL-c **(Lopes – Virella et al., 1977)**, LDL-c and VLDL-c **(Fried wald et al., 1972**), glucose **(Trinder., 1969),** aspartate amino transferase (AST) and alanine amino transferase (ALT) (**Reitman and Frankel., 1957)**, serum alkaline phosphates (ALP) (**Belfield and Goldberg., 1971)**, and leptin hormone were measured according to the method of **Guillaume and Bjorntorp., (1996).** The mean value of body weight gain % was estimated according to this equation:

BWG% = final weight-initial weight ×100 / initial weight

Data was presented as means ± SD statistically analyzed using one way ANOVA test, $p<0.05$ was used to indicate significance **(Steel and Torri., 1980)**.

Results and Discussion

Effect of Lion Leg, Sage and Senna separately or in combination on body weight gain%, feed intake and FER of obese rats.

Results in table (1) exhibit that rats fed on high fat diet revealed a highly significant increase ($p<0.05$) in the mean value of body weight, feed intake (g/day/rat) and food efficiency ratio as compared with negative control group .Treating obese rat with herbs separately or in combination showed a significant decreased ($p<0.05$) in body weight, feed intake (g/day/rat) and food efficiency ratio, as compared positive group, rats fed on high fat diet and supplemented with lion leg (4%) had highly significant

reduction in body weight than the other groups that fed on senna (0.5) or senna (1%) . the highest reduction in body weight was observed in the group fed on a combination of(lion leg 2%, sage 2%, senna 0. 5%) and the group fed on (lion leg 1% , sage 1% , senna 0.25 %) as compared to the other treated group .The percent of weight reduction was ranged between 40.02 % to 48.87% .

The influence of herbs (alchemilla, senna and sage) was very effective on reducing the body weight of obese rats so we lengthened the period of the experiment which resulted in reducing the body weight less than control negative and this support our study.

This study supported the report of **Said et al., (2002)** who studied the effect of *alchemilla* and other 3 herbs to assess its safety and efficacy in weight loss on chickens and rats. *alchemilla* and other herbs seemed to be beneficial to maintain or reduce body weight .In addition , a clinical study was carried out among 80 human ,the result recorded that a progressive and significant weight loss was seen and no side effects.

Borodin et al., (1999) conducted polyphenol compounds extracted from *alchemilla vulgaris* intense cooling stimulated synthesis of thyroid hormones and promoted their peripheral deiodination on control rats and animals. They observed that this period is characterized by a significant activation of thyroid hormone synthesis. This hormone works on increasing the metabolic rate which leads to reducing body weight.

Supplementation with sage herb seems to be beneficial to maintain or reduce body mass **(Canale et al., 2013).** Also **Tildesley et al., (2003)** made several studies on anti obese components from natural medicine to investigate

effects of *s .officinalis* and its active components on the pancreatic lipase activity and lipid digestion. In addition **Ninomiya et al .,2004** studied the methanolic (Meoh) extract and carnosic acid (carnosal) are two of its components from the leaves of s. officinalis inhibition of pancreatic lipase activity and recorded that s. officinalis leaves showed inhibitory effect against the pancreatic lipase activity, reducing body weight and obesity.

Shanmugasundaram et al., 2011and Patil et al., 2004 agree with us they reported that senna reduces serum level of total cholesterol, triglycride and LDL cholesterol level.

Also,**Shanmugasundaram et al., 2011** studied the ethanol extract of senna to investigate its anti-diabetic effect in diabetic induced rats and concluded that extract of senna has reduced blood glucose level.

These studies supported the results we obtained which indicated the effect of senna on weight loss.

Table (1): Effect of Lion Leg, Sage and Senna separately or in combination on body weight gain%, feed intake and FER of obese rats.

Parameters / Groups	IBW (g)	FBW (g)	BWG%	Feed Intake (g/day/rat)	FER
Control (-ve)	196.78±2.50 ^{a}	233.06±2.39 ^{b}	18.45±0.72 ^{b}	19	0.0636±0.00212 ^{b}
Control (+ve)	197.76±1.43 ^{a}	287.72±1.56 ^{a}	45.53±1.77 ^{a}	27	0.1111±0.00356^{a}
Lion Leg (2%)	199.70±2.47 ^{a}	169.28±1.29 ^{cd}	-15.18±1.09 ^{c}	15.5	-0.0654±0.00528^{cd}
Lion Leg (4%)	201.16±2.11 ^{a}	165.26±2.08 ^{de}	-17.81±1.32 ^{cd}	14.7	-0.0814±0.00667^{de}
Sage (2%)	198.98±3.23 ^{a}	165.40±2.29 ^{de}	-16.83±1.12 ^{cd}	15	-0.0746±0.00568^{cd}
Sage (4%)	193.50±3.68 ^{a}	161.34±3.18 ^{ef}	-16.51±2.17 ^{cd}	14.5	-0.0739±0.01063^{cd}
Senna (0.5%)	199.46±3.77 ^{a}	172.56±2.05 ^{c}	-13.39±1.48 ^{c}	16.5	-0.0543±0.00675^{c}
Senna (1%)	198.68±2.74 ^{a}	170.14±1.35 ^{cd}	-14.27±1.71 ^{c}	14.7	-0.0647±0.00845^{cd}

Mix(Lion Leg1% ,Sage 1% ,Senna 0.25%)	198.22±3.53 [a]	157.38±1.57 [f]	-20.51±1.48 [d]	14	-0.0972±0.00840[e]
Mix (Lion Leg 2%, Sage 2%,Senna 0.5%)	200.74±1.29 [a]	147.10±2.71 [g]	-26.72±1.16 [e]	13.7	-0.1324±0.00557[f]

- Values are expressed as mean ± SD.

- Significant at $p<0.05$ using one way ANOVA test.

-Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

IBW→ Initial body weight FBW→ Final body weight BWG→ Body weight gain FER→ Feed efficiency ratio

Effect of Lion Leg, Sage and Senna separately or in combination on lipid profile of obese rats.

Effect of herbals supplementation separately or in combination on serum level of total cholesterol , triglycerides (TG) , high density lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL -c) and very low density lipoprotein cholesterol (VLDL -c) in obese rats were presented in table (2).

It could be noticed that, the control positive group has shown a significant increase ($p<0.05$) in the mean values of serum TC, TG, VLDL -c and LDL-c as compared with those of the control negative group .this increase was a result of feeding rats with high fat diet that induced obesity. Results in this table revealed that, all treated obese rats with *alchemilla*, senna or sage separately or in combination showed a significant decrease ($P<0.05$) in the mean values of serum TC, TG, VLDL-c and LDL-c as compared to positive control group. While HDL-c was revealed a significantly increased for all treated rats as compared to the corresponding value of control positive but still lower than

control negative. The highest decrease (P<0.05) in the level of TC and TG was clearly observed on the group fed on high fat diet and supplemented with a combination of (lion leg 1% , sage 1% and senna 0.25%) compared with other treated groups.

Supplementation with *senna cassia* species seeds and ether soluble and water soluble fraction showed significant decrease in serum level of total cholesterol, triglycride. also the reduction in LDL cholesterol level while increased the serum HDL.one other hand later **(Shanmugasundaram et al., 2011)** conducted an experiment on albino rats by giving them the ethanol extract of senna leaves and resulted in decrease in lipid profile except HDL which increased and these results agree with **(Patil et al ., 2004)** too .

Christensen et al ., 2010 proved that an extract of Sage was able to lower the plasma cholesterol , low density lipoprotein (LDL) , and triglycerides (TGS) ,but increases the high density lipoprotein (HDL) level in lipidemic rats.

They also added that the extract of *S.officinalis* activate peroxisome proliferator activated receptor gamma (ppar□) which is a regulator of genes involved in energy spending as well as lipid and glucose metabolism and its activation improves the HDL / LDL ratio and lowers TGS in serum , reduces insulin resistance, and reduces the size of adipose (fat) tissue.

%).

Plotnikov et al., 2006) who reported that course of treatment with *alchemilla vulgaris* extract increased the concentrations of lipids and phospholipids in erythrocyte membranes decreased the number of abnormal erythrocytes

and improved deformability of red blood cells in rats with arterial hypertension.

Table(2):Effect of Lion Leg , Sage and Senna separately or in combination on lipid profile of obese rats.

Parameters / Groups	Total cholesterol (mg/dL)	Triglycerides (mg/dL)	VLDL-C (mg/dL)	HDL-C (mg/dL)	LDL-C (mg/dL)
Control (-ve)	95.80±0.90 ^{ef}	61.83±1.98 ^{e}	12.36±0.39 ^{e}	66.90±2.80 ^{a}	16.53±2.79 ^{de}
Control (+ve)	195.10±3.12 ^{a}	185.80±2.80 ^{a}	37.16±0.56 ^{a}	41.03±0.64 ^{e}	116.90±3.49 ^{a}
Lion Leg(2%)	132.33±4.48 ^{b}	103.20±3.46 ^{b}	20.64±0.69 ^{b}	47.06±1.48 ^{d}	64.62 ±5.72 ^{b}
Lion Leg(4%)	108.00±2.64 ^{d}	85.93±3.54 ^{cd}	17.18±0.70 ^{cd}	47.86±1.98 ^{d}	42.94±1.95 ^{c}
Sage(2%)	118.76±2.25 ^{c}	107.20±2.16 ^{b}	21.44±0.43 ^{b}	51.73±0.59 ^{cd}	45.59±1.97 ^{c}
Sage(4%)	98.00±2.30 ^{de}	86.40±3.21 ^{bc}	17.28±0.64 ^{bc}	54.46±2.21 ^{c}	26.25±0.67 ^{d}
Senna(0.5%)	103.86±6.63 ^{de}	106.0±7.76 ^{b}	21.20±1.55 ^{b}	61.56±1.10 ^{ab}	21.10±4.72 ^{d}
Senna(1%)	86.23±1.17 ^{fg}	85.50±3.17 ^{cd}	17.10±0.63 ^{cd}	60.93±1.62 ^{b}	8.20±0.33 ^{ef}
Low mix (Lion Leg1% ,Sage 1% ,Senna 0.25%)	83.10±3.19 ^{g}	83.26±1.50 ^{d}	16.65±0.30 ^{d}	60.13±0.46 ^{b}	6.31±2.58 ^{f}
High mix (Lion Leg 2%, Sage 2%,Senna 0.5%)	96.00±1.15 ^{ef}	95.53±3.25 ^{bc}	19.10±0.65 ^{bc}	66.90±2.80 ^{a}	9.99±3.16 ^{ef}

- Values are expressed as mean ± SD.

- Significant at $p<0.05$ using one way ANOVA test.

-Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

- VLDL-C→ very low density lipoprotein cholesterol

- HDL-C→ High density lipoprotein cholesterol

- LDL-C→ low density lipoprotein cholesterol

Effect of Lion Leg, Sage and Senna separately or in combination on liver function of obese rats.

The effect of supplementation with herbs separately or in combination on ALT, AST, and ALP in obese rats was tabulated in table (3) .It could be discerned that rats fed on high fat diet had a significant increase ($p<0.05$) in the level of serum ALT, AST, and ALP compared to the negative group. Regarding ALT there were significant decrease ($p<0.05$) in the level of ALT in all treated group with separate or in combined herbs compared with control positive. It could be concluded that supplementation with a mixtures of herbs gave the best results for AST, ALT and ALP level but still higher than control negative group for ALT and ALP.

El-Hadidy et al.,(2018) studied the influence of antioxidants activity of lion's foot (*Alchemilla vulgaris*) leaves on albino rats by supplementing these rats by different concentrations (1% , 2%) of *alchemilla* . and concluded that lion's foot can be proposed to protect hepatotoxicity induced by CCl_4 in rats . 2% was the best percentage achieved the aim of the study, Moreover **Maitya et al.,(1997)** mentioned that the extrat of senna cassia species leaves has been found to possess significant hepatoprotective activity and anti-inflammatory activity.

The compounds present in this sage preparation contain interesting bioactivities which improve the liver antioxidant potential **Cristovao et al., (2004)**.

Also **Tiwari et al., (2011)** reported that hydro-alcoholic of *cassia* species whole plant showed a marked decrease in the levels of serum markers, indicating protection of hepatic cells. Methanolic extract of *cassia* leaves at dose of 400 mg/Kg showed significant hepatoprotective effect by lowering the serum levels of transaminase

(SGOT and SGPT) bilirubin and alkaline phosphatase (ALP).

Table(3):Effect of Lion Leg , Sage and Senna separately or in combination on liver function of obese rats.

Parameters / Groups	AST (µ/L)	ALT (µ/L)	ALP
Control (-ve)	49.06±0.83 ^{d}	21.40±1.10 ^{d}	50.53±1.16 ^{c}
Control (+ve)	82.90±3.68 ^{a}	38.16±1.47 ^{a}	89.06±3.41 ^{a}
Lion Leg(2%)	65.10±1.15 ^{b}	33.53±1.68 ^{b}	71.16±4.38 ^{b}
Lion Leg(4%)	62.16±1.45 ^{b}	34.13±1.09 ^{b}	68.90±2.69 ^{b}
Sage(2%)	61.76±1.50 ^{b}	29.13±0.61 ^{c}	67.63±5.32 ^{b}
Sage(4%)	63.86±1.18 ^{b}	29.46±0.89 ^{c}	63.60±1.78 ^{b}
Senna(0.5%)	64.06±1.30 ^{b}	29.36±1.38 ^{c}	66.26±3.15 ^{b}
Senna(1%)	55.40±3.12 ^{c}	29.23±1.13 ^{c}	62.90±3.88 ^{b}
Low mix (Lion Leg1% ,Sage 1% ,Senna 0.25%)	52.26±0.79 ^{cd}	28.83±0.76 ^{c}	61.56±3.09 ^{b}
High mix (Lion Leg 2%, Sage 2%,Senna 0.5%)	52.53±0.76 ^{cd}	28.23±2.16 ^{c}	60.90±1.34 ^{b}

- AST→Aspartate amino transferase
- ALT→ Alanine amino transferase
- ALP→ Alkaline phosphatase
- Values are expressed as mean ± SD.
- Significant at $p<0.05$ using one way ANOVA test.
- Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

Effect of Lion Leg, Sage and Senna separately or in combination on kidney functions of obese rats.

The effect of supplementation with *alchemilla* , senna and sage separately or in combination on serum urea ,uric acid and creatinine in obese rats was shown in table(4), the finding illustrated that, rats fed high fat diet revealed significant increase ($p<0.05$) in the mean value of serum

urea, uric acid and creatinine , as compared with those of negative control group. The supplementation with *alchemilla*, senna and sage separately or in combination showed a significant decreased ($p>0.05$) in serum urea, uric acid and creatinine as compared to positive control group.

No significant changes where noticed in serum urea between the group fed on high fat diet and supplemented with lion leg 2% , sage 4% , senna 1% , 0.5% ,and the group mixtures lion leg 2%, sage 2% and 0.5%.The same trend was also observed between the two group supplemented with lion leg 4% and sage 2%. Meanwhile, the lowest reduction in serum urea was recorded in rats fed on the mixture of lion leg 1%, sage 1% and 0.25 %

The results indicated also that were no significant changes in the level of uric acid among the groups fed on separate herbs and the groups fed on mixtures of herbs except for the group fed on the mixture of lion leg1%, sage 1% and senna 0.25% .the lowest reduction in serum uric acid and creatinine were recorded in rats fed on the same group.

The obtained results were in agree with **Oktyabrsky et al.,2009** made an experiment in vivo using the extract of *alchemilla* and concluded that it has an antioxidant activity against H_2O_2 and protected the bacteria against oxidative damage and may linked to kidney protection against free radical. Also the study agree with that (**Singh et al., 1990)** Said that extract of senna has antibacterial activity against many bacteria including E.coli which cause inflammation to kidney and urethra. In addition **(Gill et al., 2011)** that extract of senna antioxidant activity against free radical that cause harmful to kidney. The obtained result agree with

Yadav et .,al 2011 who reported that *S.officinalis* extract contain phenolic and flavonoid compounds are mainly responsible for the antioxidant and free radical scavenging effects of these plants.

Table(4):Effect of Lion Leg , Sage and Senna separately or in combination on kidney functions of obese rats.

Parameters / Groups	Creatinine (mg/dL)	Urea nitrogen (mg/dL)	Uric acid (mg/dL)
Control (-ve)	0.64±0.07 ^{e}	22.46±0.34 ^{de}	4.00±0.40 ^{d}
Control (+ve)	1.02±0.03 ^{a}	33.76±1.40 ^{a}	6.99±0.43 ^{a}
Lion Leg(2%)	0.87±0.04 ^{bc}	26.76±0.78 ^{bc}	5.50±0.45 ^{bc}
Lion Leg(4%)	0.82±0.03 ^{bcd}	24.80±0.75 ^{cde}	5.86±0.24 ^{bc}
Sage(2%)	0.84±0.03 ^{bc}	24.46±1.81 ^{cde}	6.02±0.34 ^{b}
Sage(4%)	0.81±0.04 ^{cd}	26.03±0.96 ^{bcd}	5.53±0.16 ^{bc}
Senna(0.5%)	0.90±0.05 ^{abc}	27.23±1.53 ^{bc}	5.56±0.34 ^{bc}
Senna(1%)	0.95±0.03 ^{ab}	29.60±1.26 ^{b}	5.46±0.27 ^{bc}
Low mix (Lion Leg1% ,Sage 1% ,Senna 0.25%)	0.70±0.02 ^{de}	22.16±1.01 ^{e}	4.93±0.14 ^{cd}
High mix (Lion Leg 2%, Sage 2%, Senna 0.5%)	0.89±0.01 ^{bc}	26.10±1.06 ^{bcd}	5.43±0.20 ^{bc}

- Values are expressed as mean ± SD.

- Significant at $p<0.05$ using one way ANOVA test.

-Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

Effect of Lion Leg, Sage and Senna separately or in combination on serum glucose and leptin hormone of obese rats:

The obtained results from table (5) showed that, rats fed high fat diet revealed a significant increase ($p<0.05$) in the mean value of serum glucose and leptin hormone as compared with those of negative control group.

The results indicated that, supplementation with herbals separately significantly decreased ($p<0.05$) the level of serum glucose and leptin as compared with positive control group. There was no significant difference in the level of serum glucose and leptin among the group fed *alchemilla* ,senna or sage.

The same trend was observed among the group fed on the different mixtures of herbs.However, the level of leptin hormone was significantly decreased ($p<0.05$) for the group fed the different mixtures of herbs, as compared to the group fed a separate herbs. The highest reduction for serum glucose and leptin hormone was recorded in the group fed on high fat diet supplemented with different herbs mix.

The obtained result were agreement with **(Bahceci et al., 1999)** who reported that high fat diet result in an increasing body fat percentage with hypertriglyeridmia, hypercholsetrolemia and hyperleptinemia. The same result were obtained by **(Stachon et al., 2006)** reported significant positive between plasma leptin levels and epidermal fat mass, liver and heart weights. In addition **(Ebrahimzadeh Attari et al., 2015)** studied the supplement of 2g ginger powder for 12 weeks on obese women and found that it significantly reduced serum leptin in obese women. Ginger is a herb like *alchemilla*, senna and sage in our study which resulted in the same result of ginger on leptin hormone. On the other hand, **Flier, (1998);Heymsfield et al.,(1999) and Welt et al.,(2004)** recorded that when people lose fat leptin level decreases significantly , the brain interprets this as starvation changing our biology and behavior to make us regain the lost fat.

The obtained results disagreed with the finding of **Swanston -flatt et al., (1990)** who studied the effect of *alchemilla* and other 10 herbs and the result that 3 herbs only reduces the glucose level and the others were not effective including alchemilla.

Our results agree with **Shanmugasundaram et al., (2011)** studied the ethanol extract of senna to investigate its anti-diabetic effect in diabetic induced rats and concluded that extract of senna has significant reduction in blood glucose and increase in plasma insulin which acts on decreasing glucose level.

Christensen et al ., (2010) recorded that extract of sage decreased serum glucose in type 1in rats and also proved that exhibit insulin –like activities. **Christensen et al., (2010) and Eidi et al., (2005)** made many studies on sage extract and found that it has hypoglycemic effect in diabetic.

Table (5):Effect of Lion Leg , Sage and Senna separately or in combination on serum glucose and leptin hormone of obese rats.

Parameters / Groups	Glucose	Leptin
Control (-ve)	74.00±1.90 ^{d}	1.86±0.03 ^{d}
Control (+ve)	116.63±3.86 ^{a}	7.10±0.17 ^{a}
Lion Leg(2%)	96.91±1.65 ^{b}	3.46±0.20 ^{b}
Lion Leg(4%)	96.16±2.04 ^{b}	3.17±0.26 ^{b}
Sage(2%)	88.43±5.94 ^{bc}	2.50±0.01 ^{c}
Sage(4%)	95.80±1.79 ^{b}	2.72±0.08 ^{c}
Senna(0.5%)	86.13±2.03 ^{bc}	2.72±0.13 ^{c}
Senna(1%)	89.06±3.06 ^{bc}	2.51±0.02 ^{c}
Low mix (Lion Leg1% ,Sage 1% ,Senna 0.25%)	84.90±5.16 ^{c}	2.43±0.03 ^{c}
High mix (Lion Leg 2%, Sage 2%,Senna 0.5%)	83.60±2.74 ^{cd}	2.40±0.01 ^{c}

- Values are expressed as mean ± SD.

- Significant at $p<0.05$ using one way ANOVA test.

-Values which have different letters in each column differ significantly, while those with have similar or partially are not significant.

Conclusion

In conclusion, consumption of Lion leg or Senna or Sage or mix of them at certain levels in this study may be useful for treatment of obesity as it lowers body weight, lipid profile, liver functions, glucose level and hormones of obesity induced rats fed on high fat diet. Further studies are recommended to determine the medicinal effect of other different fractions of Lion leg , Senna and Sage extract.

REFERENCES:

1) **Al-Faris , N.A(2014) :** '' Biological evaluation of the weight reduction capacity of selected herbal products available in the Kingdom of Saudi Arabia ''. International Journal of Nutrition and Food Sciences; 3(1):7-13
2) **Allain, C.; Poon, L. and Chan, C. (1974).** Enzymatic determination of total serum cholesterol. Clin. Chem.; 20:470-475.
3) **Bahceci, M.; Tuzcu,A.;Akkus,M.; Yaldiz,M. and Ozbay, A. (1999):**" The effect of high-fat diet on the development of obesity and serum leptin level in rats ,Eat Weight Disord.,4(3):128-132.
4) **Balasankar, D. ; Vanilarasu, K. ;Selva Preetha. ; P. and Debjit Bhowmik. (2013):** Senna – A Medical Miracle Plant. Journal of Medicinal Plants Studies. Volume: 1, Issue: 3 First page: (41) Last page: (47) .
5) **Belfield, A. and Goldberg, D.M. (1971):** Alkaline Phosphatase Colorimetric Method. J. of Enzyme, (12): 561
6) **Blumenthal M, Goldberg A, Brinckman J**. **(2000):**eds. Herbal Medicine: Expanded Commission E Monographs. Newton, MA: Lippincott Williams & Wilkins:330–334

7) **Blumenthal M., Klein J, and Rister R,. (1999):** The Complete German Commission E monographs. Integrative Medical Comunication, Newtown, Boston, USA.
8) **Borodin, Yu.I., Selyatitskaya, V.G., Obukhova, L.A., Pal'chikova, N.A., Odintsov, S.V., Kukushkina, T.A(1999) .** Effects of polyphenol compounds from Alchemilla vulgaris on morphofunctional state of thyroid gland in rats exposed to low temperature Bulletin of Experimental Biology and Medicine, 127 (6), pp. 637-639.
9) **Canale MP., Villahermos SM, Martino G, Rovella V, Noce A, De Lorenzo A, et al. (2013):** Obesity-related metabolic syndrome: Mechanisms of sympathetic over activity. Int J Endocrinol. 2013 865965.
10) **Christensen KB., Jorgenson M, Kotowska D, Peterson RK, Kristiansen K, Christensen LP.(2010):** Activation of the nuclear receptor PPARγ by metabolites isolated from sage (Salvia officinalis L.) J Ethnopharmacol. 132:127–33.
11) **Cristovao, F.L, Paula, B.A.d.e ; Rosa, M.S.; Manuel ,F.F. and Cristina,P.W.(2005):"** The drinking of a Salvia officinalis infusion improves liver antioxidant status in mice and rats . Journal of Ethnopharmacology. Volume (97), Issue(2), Pages 383-389.
12) **Ebrahimzadehattari,V.; Ostadrahimi, A.; Asgharij-afarabadi, M.; Mehralizaeh, S. and Mahluji, S. (2015):**" changes of serum adipoytokines and body weight following Zingiberofficinale supplementation in obese women . A RCT, Eur J Nutr.;55(6):2129-2136.
13) **Eidi M., Eidi A, Zamanizadeh H.(2005):** Effect of Salvia officinalis L. leaves on serum glucose and insulin in healthy and streptozotocin-induced diabetic rats. J Ethnopharmcol.100: 3103.
14) **El-Hadidy, E. ; Refat, O.; Halaby, M. ; Elmetwaly, E. and Omar, A. (2018):** Effect of Lion's Foot (Alchemilla vulgaris) on Liver and Renal Functions in Rats Induced by CCl4 . Food and Nutrition Sciences, 9, 46-62. doi: 10.4236/fns Vol.9 No.1, January .2018.91004
15) **Flier, J.S.(1998):** "Clinical review 94: What´s in a name ?In search of leptin´s physiologic role .J.clin.Endocrinal. Metab. 83:1407.

16) **Foster, L. B. and Dumns, T. T. (1973).** Determination of triglycerides. J. Clin. Chem.; 19:338-353.

17) **Fried wald, W. T.; Leve, R. I. and Fredrickson، D. S. (1972).** Estimation of the concentration of low-density lipoprotein separation by three different methods . Cli. Chem.; 18: 499-502.

18) **Gill NS., Sharma A, Arora R, Bali M. (2011):** Evaluation of Cassia species seeds for their antioxidant and antiulcer activity. J Med Sci. 11 (2):96-101

19) **Guillaume, M. and Bjorntorp, P. (1996).** Obesity in Children, environmental and genetic aspects. Horm. Metab. Res.; 28, 573-581.

20) **Heymsfield, S.B.; Greenberg, A.S.; Fujioka, K.; Dixon R.M; Kushner, R.; Hunt, T.; Lubina, J.A.; Patane, J.; Self, B.; Hunt, P. and McCamish, M. (1999):**"Recombinant leptin for weight loss in obese and lean adults: a randomized, controlled, dose-escalation trial ,JAMA. 282:1568-1575.doi: 10.1001/jama.282.16.1568.

21) **Ke^ke^, LM; Samouda , H.; Jacobs , J.; di Pompeo, C.; Lemdani , M.; Hubert, H.;Zitouni, D. and Guinhouya, B.C (2015) :**'' Body mass index and childhood obesity classification systems: A comparison of the French, International obesity Task Force and World Health Organization references" . revue d'E pide mioloigie et de Sant Publique .;63 173-182

22) **Lopes-Virella, M. F.; Stone, S.; Ellis, S. and Collwellm J. A. (1977).** Cholesterol determination in high-density lipoproteins separated by three different methods. Clin. Chem.; 23 (5): 882-893.

23) **Maitya TK., Mandal SC, Mukherjee PK. Saha K, Dass J, Saha BP, et al (1997):** Evaluation of hepatoprotective potential of Cassia speciesleaf extract, Nat. Prod. Sci 3:122.

24) **Min, L.; Ling , S.; Yin, L.; Stephen, C.; Randy, J.; David, D. and Patrick, T. (2004):** " Obesity induced by a high fat diet down regulates apolipoprtein A-IV gene expression in rat hypothalamus''., Am J Physiol Endocrinol Metab., 287:E366-E370.

25) **Moreno, G.M.(2012):** " Definition and classification of obesity '' . Revista Medica Clinica Las Condes. ;23(2):124-128.

26) **National Nutrition Institutes ,(2004):** " Report on the prevalence of obesity in Egypt .

27) **Ninomiya K., Matsuda H, Shimoda H, Nishida N, Kasajima N, Youshino T, et al.(2004):** Carnosic acid, a new class of lipid absorption inhibitor from sage. Bioorg Med Chem Lett. 14:1943–6.

28) **Oktyabrsky O., Vysochina G., Muzyka N., Samoilova Z., Kukushkina T., Smirnova G. (2009):** J Appl Microbiol. Apr;106(4):1175-83.

29) **Patil, U.K.; Saraf, S. Dixit, V.K.** "Hypolipidemic activity of seeds of Cassia species Linn. J. of Ethnopharmacol 2004;90 (2-3):249-252.

30) **Plotnikov, M.B.; Aliev, O.I.; Andreeva, V.Yu.; Vasil'ev, A.S. and Kalinkina, G.I.(2006) :**Effect of Alchemilla vulgaris extract on the structure and function of erythrocyte membranes during experimental arterial hypertension Bulletin of Experimental Biology and Medicine, 141 (6), pp. 708-711.

31) **Reeves, P.G.; Nielsen , F.H. and Fahey, G.C. (1993):** "AIN-93 purified diets for laboratory rodents : final report of the American Institute of Nutrition of the AIN-76A rodent diet" . J Nutr.;123:1939-51

32) **Reitman, S. and Frankel, S. (1957).** Determination of glutamate pyruvate transferase. Am. J. Clin. Path., 28:56.

33) **Said. O., Khalil, K.H, Azaizeh H, Fulder, S. (2002):** Ethnopharmacological survey of the medical herbs in Israel, the Golan Heights and the West Bank. J Ethnopharmacol;83:251–65.

34) **Shanmugasundaram, R.; Kalpana Devi, V.; Tresina Soris, P.; Maruthupandian, A. and Mohan, V.R. (2011) :** Antidiabetic, antihyperlipidaemic and antioxidant activity of Senna auriculata (L.) Roxb. leaves in alloxan induced diabetic rats International Journal of Pharm Tech Research, 3 (2) , pp. 747-756.

35) **Singh VK., Khan A M.(1990):** Medicinal Plants and Folklores - A Stratergy towardsConquest of Human Ailments. Vol. 9. Today & Tomorrow Printers & Publishers:67.

36) **Stachon, M.; Fürstenberg, E. and Gromadzka-Ostrowska, E. (2006) :**" Effects ofhigh-fat diets on body composition,

hypothalamus NPY, and plasma leptin corticosterone levels in rats ‖ ,J.Endocr.;30(1):69-74.

37) **Steel, R. G. and Torri, J. H. (1980):** Principal and Procedures of Statistical, Biometrical Approach. Pbl. Mc Grew Hill Book Company. 2nd ed. New York, U.S.A.

38) **Swanston-Flatt, S.K.;Day, C.;Bailey, C.J.and Flatt, P.R.(1990):** "Traditional plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice‖ . Diabetologia. Aug;33(8):462-4. PMID 2210118 [Indexed for MEDLINE]

39) **Tildesley NT., Kennedy DO, Perry EK, Ballard CG, Savelev S, Wesnes KA, et al.(2003):** "Salvia lavandulaefolia (Spanish sage) enhances memory in healthy young volunteers. Pharmacol Biochem and Behav. 75:669–74.

40) **Tiwari P., Kumar K, Panik R.(2011**): Hepatoprotective effects of Cassia species whole plant. International Journal of Pharmacy & Technology. 3(2):2798-2806.

41) **Trinder, P. (1969).** Determination of glucose in blood using glucose oxidase with an alternative oxygen acceptor. Ann. Clin. Biocheme.; 6: 24-28.

42) **Welt, C.K.; Chan, J.L.; Bullen, J.; Murphy, R.; Smith, P.; DePaoli, A.M.; Karalis, A. and Mantzoros, C.S. (2004**):" Recombinant human leptin in women with hypothalamic amenorrhea‖ .N. Engl. J.Med.351:987-997.doi:10.1056/NEJM oa040388.

43) **Yadav S., Mukundan U. (2011):** In vitro antioxidant properties of Salvia coccinea Buc'hoz ex etl. and Salvia officinalis L. Indian J Fundam Appl Life Sci. 1:232–8.

44) **Zare, R.; Heshmati, F.; Fallahzadeh, H. and Nadjarzadeh, A. (2014):** " Effect of cumin powder on body composition and lipid profile in overweight and obese women ".complementary Therapies in Clinical Practice ;20(4):297-301.