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Comparative Study between the Effect of Chitocal and Herbal Mixtures in loss Weight of Induced Obesity Rats

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ABSTRACT:

Most people's which can lead to diseases including diabetes and atherosclerosis. Chemical formulas could have detrimental impacts on health. Meanwhile, The primary objective of the present study is to compare the impact of Chitocal, a combination of herbal ingredients (turmeric and ginger), on obese rats. Forty-eight adult male albino rats were divided into two main groups. The first group, comprising six rats, was the control group, and a basal diet (BD) was provided. The second main group, consisting of forty-two rats, was given a high-fat diet to induce obesity and divided into seven equal subgroups. These subgroups included a positive control group (BD) and groups fed with BD containing 2.5% and 5.0% Critical, herbal mixture, and a combination of both (w/w). After 28 days, the weight gain, food intake, and food efficiency ratio were evaluated. Blood samples were also analyzed to determine the levels of liver enzymes (AST, ALT), lipid profile (T.G., T.C., LDL-c, HDL-c, and VLDL-c), kidney functions (uric acid, urea, and creatinine), glucose levels, and a complete blood count (CBC), including white blood cells (WBC) and red blood cells (RBC). The results revealed that obesity led to disturbances in BWG, FI, and FER. Furthermore, the functions of the liver and kidneys, as well as the lipid profile and glucose levels in the serum, were affected. Treating obese rats with critical herbal mixtures improved all of these parameters.

Keywords: *Chitosan, Lipid Profile, Weight Loss, Herbs, Biochemical Analyses.*

1. INTRODUCTION

A complicated disorder, obesity is brought on by the combination of multiple environmental, nutritional, lifestyle, and hereditary variables (1). Diabetes, cardiovascular disease, and disorders of the limbs are among the comorbidities linked to obesity. Additionally, it has a big effect on the person's social, financial, and psychological well-being, which could lead to depression developing (2). As the obesity pandemic continues to grow, obesity is becoming an international

public health concern. The majority of people are affected by this worldwide disease, despite its complex origin (3). In previous years, there was increased interest in the use of anti-obesity medications to decrease bodyweight through decreasing food intake or absorption or increasing energy expenditure (4).

Lower blood pressure, cholesterol levels, and the incidence of cardiovascular disease (CVD) are known to be caused by weight loss and decreased visceral fatal (5). Chitosan, the prevailing and innate cationic polysaccharide recognized subsequent to cellulose, is primarily derived from the exoskeletons of crustaceans, molluscs, fungi, and insects (6). Numerous investigations have demonstrated that consumption of chitosan possesses a significant lipid-reducing impact on serum lipids in both human and animal subjects. (3). There are several lipid-lowering drugs (Chitosan medication) may have unfavorable side effects including nausea and vomiting (7).

Chitocal is a very potent weight-loss supplement that blocks the absorption of fat and explodes with carbohydrates. High density chitosan, a naturally occurring polymer made up of copolymers of glucosamine and N-acetyl glucosamine, is found in chytocal. Chitin, the second most abundant natural polymer after cellulose, is generated from crustacean shells after partial deacetylation (8).

Warfarin is a more dangerous side effect that may impact individuals who have heart issues. Long-term use may cause some minerals and fat soluble vitamins to be less absorbed. Because of this, a lot of research has been done on herbs and plant extracts that provide comparable advantages without the negative effects (9), (10)

One member of the Zingiberaceae family of perennial herbs is turmeric (Curcuma longa L.), a rhizomatous plant. Applications of the Curcuma genus in medicine have long been known (11),(12). The chemicals found in turmeric include mono and sesquiterpenoids, which are volatile oil constituents, as well as Curcuma species, which possess a diverse array of beneficial pharmacological traits. In addition to the bioactive, non-volatile curcuminoids, namely curcumin, dimethoxy-, and bisdemethoxy-curcumin, these characteristics include anti-inflammatory, anticancer, antidiabetic, hypocholesterolemic, antithrombotic,(13) anti-hepatotoxic, carminative, diuretic, anti-rheumatic, hypotensive, antimicrobial, antiviral, and antioxidant properties (14), (15).

Ginger (Zingiber officinale) is a member of the subtropical/ tropical Zingiberaceae family and is extensively used as a flavoring and spice, particularly in Asian cuisine (16). Numerous beneficial nutrients, such as the powerful gingerols and shogaols, as well as flavonoids and terpenoids, can be found within the

ginger root (17). Ginger possesses an impressive array of biological properties, including its anti-inflammatory and antibacterial effects, which have been thoroughly researched and documented. antioxidant, and anti-cancer properties. (18), (19).

Ginger may also help prevent and treat a number of illnesses, including respiratory issues, diabetes mellitus, obesity, cardiovascular disease, neurological diseases, and nausea and vomiting brought on by chemotherapy (20), (21).

Therefore, the major goal of the research was to know the extent of the effect of Chitocal and a group of herbs on reducing the weight of experimental rats, and which of them is healthier in order to reach the ideal weight without causing health complications.

2. Material and Methods

2.1. Materials

Chitocal were obtained from Al-Gomhoria Company for Drug, Chemicals and Medicals, Instruments, Cairo, Egypt. Herbin El Koum's Herbal Store provided the herbal combinations (tumirec and ginger).

2.1.1.Experimental animals:

A total of forty-eight adult male albino rats of the Sprague Dawley strain, weighing 200±10g, were diligently acquired from the Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt.

The finest quality casein, cellulose, choline chloride, and DL methionine powder were carefully sourced from Morgan Co., located in Cairo, Egypt.For this meticulous study, the cholesterol powder and all necessary chemical kits were procured from the Al-Gomhoria company,

2.2. Methods

2.2.1. Preparation of Chitocal and herbal mixture:

Chitocal was fully dissolved in a 1% (v/v) solution of acetic acid, ensuring complete integration. To obtain a fine powder, the dried herbs were meticulously crushed using the high-speed combination provided by Moulinex Egypt, Al-Araby Co.

To prepare the herbal combinations (tumirec and ginger) powders, were washed thoroughly under running tap water, shade dried and ground to a fine powder using an air mill (Molunix, Al-Araby Company, Egypt).These powdered herbs were then carefully stored in a collection of dark, airtight glass bottles, safeguarding their potency in a cool and dry environment until they were ready for use (22).

2.2.2. Experimental design:

Forty-eight adult male white albino rats, aged 10 weeks and weighing (200±10 g), were utilized in this particular experiment. All of the rats were provided with a standard diet for a period of 7 days to allow for adaptation, stated in (23). Subsequently, the rats were randomly assigned into two primary groups. The first group, denoted as -ve G (n = 6), solely received the standard diet. The

second group consisted of obese rats (n=42). The obese rats were further divided into 7 sub-groups, each containing 6 rats, based on the following criteria:

Sub-group 1: +Ve G, fed on standard diet only.

Sub-group 2: A group infected obestiy is fed on Chitocal as powder by 2.5% of the weight of the diet

Sub-group 3: A group infected obestiy is fed on Chitocal as powder by 5% of the weight of the diet

Sub-group 4: A group infected obestiy is fed on herbs mixture (HM) as powder by 2.5% of the weight of the diet

Sub-group 5: A group infected obestiy is fed on herbs mixture (HM) as powder by 5% of the weight of the diet

Sub-group 6: A group infected obestiy is fed on herbs mixture (HM) and Chitocal as powder by 2.5% of the weight of the diet

Sub-group 7: A group infected obestiy is fed on herbs mixture (HM) and Chitocal as powder by 5% of the weight of the diet

Rats were observed for general behavior during the trial time, and weekly estimates of feed consumption and body weight increase were made.

2.2.3. Blood sampling

When the 28-day trial is over, each rat is weighed individually, and following a 12-hour fast, the rats are euthanized and samples of their blood are extracted. Following centrifugation of the blood samples at a speed of 4000 rpm for a duration of 10 minutes, the separation of the blood serum is achieved. Subsequently, the blood serum is preserved in a deep freezer until it is required.

2.2.4. Ethical approval

Scientific Research Ethics Committee (Animals Care and Use), Faculty of Home Economics, Menoufia University, Shebin El-kom, Egypt, approved the study's biological experiments as ethically acceptable. Endorsed the study protocol #08-SREC-01-2018.

2.2.5. Biological evaluation

The feed efficiency ratio (FER) and body weight gain percentage (BWG) for the various diets were determined using the formulas provided in accordance with (24).

Biological Evaluation.:

$$\text{Body weight gain (g)} = \text{Final weight} - \text{Intinal weight}$$

$$\text{BWG \%} = \frac{\text{Final weight} - \text{Intinal weight}}{\text{Intinal weight}} \times 100$$

$$\text{FER} = \frac{\text{Gain in body weight (g)}}{\text{Food intake (g)}}$$

2.2.6. Biochemical analysis

Different serum parameters were determination using specific procedures, as follows: glucose was carried out in accordance to the method of (25). Triglycerides, total cholesterol and HDL-cholesterol determination of were carried out in accordance to (26), (27) and (28). VLDL and LDL-cholesterol, the calculation of VLDL (very low-density lipoproteins) and LDL were carried out according to the method of (29) as follows: VLDL (mg/dl) = Triglycerides/5. LDL (mg/dl) = (Total cholesterol + HDL) – VLDL. Atherogenic

index (A.I) measured in accordance to method described by (30) AST and ALT activities were measured using the method described by (31) and (32). Urea and creatinine were determined using the enzymatic technique of (33) and (34). The CBC test included WBC count, RBC count, estimated in accordance to the method described by (35).

2.3. Statistical analysis

The mean ± SD is the recorded result. Using a statistical analysis system (36), the experimental data were analyzed using an analysis of variance (ANOVA) for a totally randomized design. The means differences at the 5% level were ascertained using Duncan's multiple range tests.

3. Results and Discussion

The data presented in Table (1) revealed the impact of chitocal, an herbal blend, and a combination of chitocal + herbs on the Rats' body weight growth (BWG), intake of feed, and feed efficiency ratio (FER) of rats with induced obesity. The results demonstrated that the positive control group had significantly higher BWG levels than the negative control group (P≤ 0.05). Average values were (5.61 and 1.44) g per 28 days, successively. Obesity leads to many noticeable changes in body weight and the amount of food consumed and leads to many complications (37).

On the other hand, all the experimental groups exhibited a notable decline in BWG compared to the control group. Among the treated groups, the highest levels of body weight gain were observed in the induced obesity groups that received a 2.5% herbal mixture, while the lowest levels were recorded in the group that received a combination of 5% Chitocal and herbal mixture, demonstrating significant variations (P≤0.05). A previous study (38) revealed a significant decrease in body weight with the administration of Chitocal, with mean values of (92 and 71.00)mg / dl, respectively. However, there were no significant differences (P<0.05) between These findings align with the results reported by (39), observed a considerable drop in body weight and body fat in healthy obese individuals after consuming steamed ginger ethanolic extract for 12 weeks.

With regard to FER, a positive control group achieved the highest levels recorded, whereas the negative control group achieved a low value with significant (P≤0.05) differences. Respective mean values were 0.315 , 0.082.

For the groups that received treatment (induced obesity groups), the levels of FER were highest for the 2.5% herbal mixture, while a low value was recorded for the 5% Chitocal + herbal mixture, showing significant (P≤0.05) differences. Respective mean values were 0.258 , 0.055,found in (40) that the results aligned with these findings, indicating that the consumption of 1200 mg of turmeric over an 8-week period resulted

in a decrease in body mass index (BMI) among patients with type 2 diabetes. (41) also discovered that the daily intake of 1500 mg of curcumin led to weight reduction in individuals with type 2 diabetes. (42) demonstrated that ginger possesses properties that combat obesity, ultimately leading to a decrease in body weight and fat mass. (43) reported that the extract of curcumin, which is the most significant phenolic compound found in turmeric, effectively mitigated obesity and the associated renal pathology.

Table (1): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture on body weight gain (BWG), feed intake (FI) and Feed efficiency ratio (FER) of obesity rats:

Parameters Groups	Body weight gain (BWG) (g/ 28 day)	Feed intake (g/day)	Feed efficiency ratio
G1: Control negative	1.44e±0.01	17.62a±1.06	0.082e±0.005
G2: Control positive	5.61a±0.04	17.85a±0.40	0.315a±0.008
G3: (2.5% Chitocal)	2.88c±0.06	17.37a±0.56	0.166c±0.009
G4: (5% Chitocal)	1.08f±0.06	17.58a±0.45	0.061f±0.002
G5: (2.5% HM)	4.43b±0.04	17.23a±0.87	0.258b±0.015
G6: (5% HM)	1.45e±0.04	16.47a±0.49	0.088e±0.005
G7: (2.5% Chitocal + HM)	1.74d±0.02	16.52a±0.71	0.105d±0.004
G8: (5% Chitocal + HM)	0.93g±0.01	16.87a±0.35	0.055f±0.002
LSD	0.63	1.14	0.013

Each value is represented as mean ± standard deviation (n = 6). Mean under the same column bearing different superscript letters are different significantly (p< 0.05). : HM: herbal mixture, BWG: body weight gain

The data presented in Table (2) unveiled the impact of Chitocal, a concoction of herbs, and a blend of Chitocal with herbs on the levels of serum total triglycerides (TG) and serum total cholesterol (TC) in rats with induced obesity. Results obtained indicated that the positive control group exhibited high levels of serum triglycerides (TG), while the negative control group displayed a low value with noteworthy (P≤0.05) variations. Mean values were recorded as 189.00mg/dl and 70.09mg/dl, respectively,(44) reported Chitosan has been shown to lower plasma levels of total cholesterol (TC) and total triglyceride (TG) in plasma.

On the contrary, the highest levels of serum triglycerides in the treated groups (induced obesity groups) were observed in the 2.5% mixture of herbs, while a low value was observed in 5% Chitocal, with significant (P≤0.05) differences. Mean values were 92.00 mg/dl , 71.00 mg/dl, accordingly.

Regarding levels of serum total cholesterol, it can be inferred that the highest levels of serum cholesterol were observed in the positive control group, while the negative control group recorded the lowest value, with significant

(P≤0.05) differences. Mean values were(354.00 and 90.00)mg/dl, accordingly.

For the groups that received treatment (induced obesity groups), total cholesterol levels were the highest for the 2.5% mixture of herbs, while a low value was observed for 5% Chitocal, and these differences were found to be statistically significant (P≤0.05). Mean values for these two groups were 194.50mg/dl and 103.50 mg/dl, respectively. According to (45), curcumin has been shown to reduce the chronic inflammation and metabolic diseases (including obesity) that are associated with a high-fat, high-cholesterol diet typically found in Western-type diets, reported that daily consuming 1500 mg of ginger for 12 weeks significantly reduced TC levels in patients with non-alcoholic fatty liver disease.(46),(47)

Table (2): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture on serum triglycerides (T.G) and serum total cholesterol (T.C) of induced obesity rats:

Parameters Groups	Triglycerides (T.G) mg/dl	Total cholesterol (T.C) mg/dl
G1: Control negative	70.09 h ± 0.18	90.00 H ± 0.81
G2: Control positive	189.00 a ± 0.98	354.00 a ± 0.73
G3: (2.5% Chitocal)	79.00 d ± 0.25	143.00 d ± 0.90
G4: (5% Chitocal)	71.00 g ± 0.15	103.50 g ± 0.54
G5: (2.5% HM)	92.00 b ± 0.49	194.50 b ± 0.68
G6: (5% HM)	74.00 f ± 0.40	129.50 e ± 0.40
G7: (2.5% Chitocal + HM)	89.50 c ± 0.37	148.00 c ± 0.21
G8: (5% Chitocal + HM)	75.00 e ± 0.63	119.00 f ± 0.13
LSD	0.87	1.06

Table (3): illustrates the impact of Chitocal, herbal mixture, and Chitocal + herbal mixture on the levels of high-density lipoprotein cholesterol (HDL-c), low-density lipoprotein cholesterol (LDL-c), and very low-density lipoprotein cholesterol (VLDL-c) in rats with induced obesity. Evidently, the negative control group exhibited high levels of high-density lipoprotein cholesterol (HDL-c), while the positive control group demonstrated a low value with significant (P≤0.05) differences. Mean values were 44.50 mg/dl, 29.00 mg/dl, successively.

High levels of high-density lipoprotein cholesterol were observed in the treated groups that received 5% Chitocal, whereas a low value was recorded in the group treated with a 2.5% herb mixture, demonstrating a significant (P≤0.05) difference. Specifically, Mean values for these groups were 40.50 mg/dl, 32.00 mg/dl, successively ,results agreed with (44), reported that chitosan could decrease levels of LDL-c in plasma.

There were significant (P>0.05) differences between 2.5% Chitocal and 5% Chitocal + herbal mixture groups, Also There were significant (P>0.05) differences between negative control, positive control and 2.5% Chitocal + herbal mixture groups. The data also revealed that the positive control group exhibited high levels of low-density lipoprotein cholesterol (LDL-c), whereas the negative control group displayed a low value, with notable discrepancies between the two. Specifically, Mean values were 287.20 mg/dl and 31.50 mg/dl, successively. As for the treated groups, the 2.5% herb mixture demonstrated a high recorded value for low-density lipoprotein cholesterol levels, while a 5% Chitocal group recorded a low value with significant (P≤0.05) differences. Mean values were 144.60, 51.99 mg/dl, successively.

In cases of (VLDL-c), the positive control group achieved the most elevated value, while the negative control group demonstrated a low value, with notable distinctions. Average values were 37.80 mg/dl, 14.00 mg/dl, respectively. In cases of treated groups, a high value of very low-density lipoprotein cholesterol levels was observed for the 2.5% combination of herbs, while 5% Chitocal group recorded its low value with significant (P≤0.05) differences. Mean values were 18.40, 14.20 mg/dl, successively.

Results are agreed with (48), proved that treated obese rats with Chitocal improved lipid profile by reducing LDL-c, VLDL-c and increasing HDL-c levels compared to control groups. And (49), proved that SIDF prevents obesity in HFD mice by reducing LDL-c, VLDLc and increasing HDL-c levels.

Table (3): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture on lipid profile of induced obesity rats:

Parameters Groups	HDL-c mg/dl	LDL-c mg/dl	VLDL-c mg/dl
G1: Control negative	44.50a±0.97	31.50h±0.17	14.00h±0.01
G2: Control positive	29.00f±0.18	287.20a±0.35	37.80a±0.2
G3: (2.5% Chitocal)	36.50e±0.77	92.80d±0.80	15.80d±0.05
G4: (5% Chitocal)	40.50b±0.11	51.99g±0.36	14.20g±0.03
G5: (2.5% HM)	32.00g±0.37	144.60b±0.24	18.40b±0.1
G6: (5% HM)	38.50c±0.50	66.20f±0.75	14.80f±0.08
G7: (2.5% Chitocal + HM)	36.00f±0.07	94.70c±0.37	17.90c±0.07
G8: (5% Chitocal + HM)	37.00d±0.83	70.60e±0.19	15.00e±0.13
LSD	1.00	0.80	0.17

HDL-c = High density lipoprotein cholesterol. LDL-c = Low density lipoprotein cholesterol. VLDL -c = Very low-density lipoprotein cholesterol, HM: herbal mixture

The data presented in Table (4) illustrates the impact of Chitocal, a herbal mixture, and the combination of Chitocal and the herbal mixture on the serum glucose levels of rats with induced obesity. Findings indicate that the positive control group exhibited the highest recorded value, whereas the negative control group exhibited a low value with statistically significant (P≤0.05) differences.

Mean values were 268.00 mg/dl, 84.00 mg/dl, successively. Among the treated groups, the 2.5% herb mixture showed high glucose levels, while the 5% Chitocal group exhibited a low value with statistically significant (P≤0.05) differences.

Mean values were 164.50 mg/dl, 108.50 mg/dl, successively. These results are consistent with a study by (50), which found a significant decrease in glycemic profiles in patients with type 2 diabetes after ginger supplementation. Additionally, another study (41) observed positive effects on reducing fasting blood glucose levels in patients with type 2 diabetes through the daily administration of 1500 mg of curcumin.(51)

Ginger supplementation at 1.2 g/day for three months significantly reduced HbA1C25 levels in individuals with diabetes type 2.

Data in Table (5) demonstrate the influence of Chitocal, herbal mixture and Chitocal + herbal mixture on serum liver functions levels (ALT and AST) of induced obesity rats. It's clear to notice that a high value of serum ALT levels recorded for the positive control group, while a negative control group recorded a low value with significant (P≤0.05) differences. Mean values were 210.00, 47.00 U/L, successively. For treated groups, a high value of serum ALT levels was recorded for 5% Chitocal, while 5% Chitocal + herbal mixture group recorded a low value with significant (P≤0.05) differences. Mean values were 107.5, 60.00 U/L, respectively.

Table (4): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture on serum glucose levels of induced obesity rats:

Parameter Groups	Glucose (mg/dl)
G1: Control negative	84.0h±0.62
G2: Control positive	268.0a±0.9
G3: (2.5% Chitocal)	149.0d±0.73
G4: (5% Chitocal)	108.5g±0.27
G5: (2.5% HM)	164.5b±0.59
G6: (5% HM)	113.0f±0.33
G7:(2.5% Chitocal+HM)	157.5c±0.5
G8: (5% Chitocal + HM)	145.0e±0.81
LSD	1.09

HM: herbal mixture.

These results agreed with (52), reported that treating obese rats with Chitocal showed the highest significant decrease in ALT and AST levels compared to controls and obese rats treated with green tea extract and orlistat.

In cases of serum AST, it can be inferred that the positive control group exhibited the highest recorded levels of serum AST, while the negative control group displayed low levels, with statistically significant (P≤0.05) differences. Respective mean values were (220.50 and

41.5) U/L. Among the treated groups, the highest recorded value of serum AST levels was observed in the 5% Chitocal group, whereas the 5% Chitocal + herbal mixture group exhibited the lowest value, also with statistically significant differences (P≤0.05). Mean values for these groups were 124.00 and 50.00 U/L, respectively. Our results align with previous studies that have shown that ginger supplementation at a dosage of 2000 mg for 12 weeks resulted in a significant decrease in serum ALT levels in obese women. (54), (55) and (56) proposed that turmeric could potentially have a positive impact on the levels of ALT and AST in the blood of individuals suffering from non-alcoholic fatty liver disease (NAFLD).

Table (5): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture on liver functions of induced obesity rats:

Parameters Groups	ALT U/L	AST U/L
G1: Control negative	47.00 h ± 0.54	41.50 h ± 0.50
G2: Control positive	210.00 a ± 0.43	220.50 a ± 0.88
G3: (2.5% Chitocal)	87.5 c ± 0.70	96.00 c ± 0.70
G4: (5% Chitocal)	107.50 b ± 0.31	124.00 b± 0.30
G5: (2.5% HM)	78.00 d ± 0.95	87.50 d ± 0.46
G6: (5% HM)	64.00 e ± 0.6	66.97 e ± 0.45
G7: (2.5% Chitocal + HM)	62.50 f ± 0.82	62.17 f ± 0.49
G8: (5% Chitocal + HM)	60.00 g ± 0.11	50.00 g ± 0.21
LSD	1.06	0.93

ALT: alanine aminotransferase, AST: aspartate aminotransferase, HM: herbal mixture

Table (6) demonstrate the influence of Chitocal, a herbal mixture, and a combination of Chitocal and herbal mixture on kidney functions, specifically serum urea, serum uric acid, and serum creatinine levels in rats with induced obesity. The study found that the positive control group had significantly higher serum urea levels than the negative control group (P≤0.05). The average readings were 71.00 and 51.44 mg/dL, successively.

Among the treated groups, the 5% Chitocal group had high serum urea levels, while the 5% herbal mixture group had a low level, also with significant differences (P≤0.05). Mean values were 68.50, 51.50 mg/dl, successively.

A positive control group had high blood uric acid levels (57), while the negative control group had low values, indicating significant (P≤0.05) differences. The average readings were 6.84 and 4.66 mg/dL, correspondingly.

Among the treatment groups, the 5% Chitocal group had high blood uric acid levels, while the 5% herbal combination group had low values, with significant

(P<0.05) differences. The average readings were 6.67, 4.11 mg/dL, correspondingly.

Regarding serum creatinine, it can be concluded that the positive control group had high levels, whilst the negative control group had low levels, with significant (P≤0.05) differences. Mean values were 3.18 and 0.63 mg/dl, correspondingly. Among the treated groups, the 5% Chitocal group had high serum creatinine levels, while the 5% herbal mixture group had a low level, also with significant (P≤0.05) differences. Mean values were 2.70, 0.62 mg/dl, correspondingly.

Its results are consistent with previous research that found no improvement in kidney functions with chitosan supplementation (58).

Table (6): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture kidney functions of induced obesity rats:

Parameters Groups	Urea mg/dl	Uric acid mg/dl	Creatinine mg/dl
G1: Control negative	51.44e±0.07	4.66c±0.60	0.63e±0.01
G2: Control positive	71.00a±0.50	6.84a±0.21	3.18a±0.15
G3: (2.5% Chitocal)	62.50c±0.81	5.60b±0.30	1.66c±0.13
G4: (5% Chitocal)	68.50b±0.75	6.67a±0.02	2.70a±0.13
G5: (2.5% HM)	52.00e±0.45	4.48c±0.08	1.14d±0.05
G6: (5% HM)	51.50e±0.19	4.11c±0.18	0.62e±0.18
G7: (2.5% Chitocal + HM	62.00c±0.20	4.43c±0.46	1.66c±0.03
G8: (5% Chitocal + HM)	59.00d±0.32	4.75c±0.14	1.46c±0.22
LSD	0.83	0.54	0.23

HM: herbal mixture

Table (7) demonstrate the influence of Chitocal, a herbal mixture, and a combination of Chitocal and herbal mixtures on red blood cells (RBCs) and white blood cells (WBCs) in rats with induced obesity. The results obtained indicate that the negative control group had the highest levels of RBCs, while the positive control group had low levels, with significant (P≤0.05) differences. Mean values were 9.00 and 4.12 mm3, correspondingly.

The results are consistent with previous research that reported the beneficial effects of curcumin and ginger on hematological values and stress levels, including WBC counts, in experimental animals (59) and (60). .

4- Conclusion

Results show that obesity led to the occurrence of many clear biological and biochemical changes. Our use of Chitocal and herbs such as turmeric and ginger led to an improvement in the indicators and indications that explain their effect on obesity.

The best results recorded for eighth group 5% mixture of chitocal and herbal mixture. Each of them had a clear and influential effect, but when mixed directly together, they had a significant effect. In losing weight and improving general health.

Table (7): Effect of Chitocal, herbal mixture and Chitocal + herbal mixture on red blood cells levels of inuced obesityratskidney functions of induced obesity rats:

parameters Groups	R.B. Cs (106/mm3)	W.B. Cs (103/mm3)
G1: Control negative	9.1a±0.10	4.6de±0.60
G2: Control positive	4.1f±0.21	19.3a±0.80
G3: (2.5% Chitocal)	4.9e±0.39	4.3e±0.63
G4: (5% Chitocal)	8.0b±0.64	3.9e±0.25
G5: (2.5% HM)	5.6d±0.48	6.9bc±0.05
G6: (5% HM)	8.6ab±0.38	6.6bc±0.70
G7: (2.5% Chitocal + HM)	7.2c±0.30	7.9b±0.77
G8: (5% Chitocal + HM)	8.0b±0.13	5.7cd±0.90
LSD	0.64	1.12

RBCs: Red blood cells. WBCs: White blood cells. HM: herbal mixture.

5. References

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التغذية وعلوم الاطعمة

دراسة مقارنة بين تأثير الشيتوكال ومخلوط بعض الأعشاب في إنقاص وزن الفئران المصابة بالسمنة

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الملخص العربى:

من المشـــاكل التى يعاني منها معظم الناس هى الســـمنة والتى يمكن أن تؤدي إلى العديد من الأمراض مثل الســـكري وتصـــلب الشـــرايين. المركبات والأدوية الكيميائية يكون لها العديد من الآثار الجانبية التى تؤثر على الصحة. بينما استخدامنا توليفه أعشاب لا يكون له أي آثار جانبية على الصـــحة. لذلك كان الهدف الاســـاسي للدراســـه مقارنه تأثير خليط الأعشـــاب (الكركم والزنجبيل) مع الشيتوكال على الفئران المصابة بالسمنة. 48 فأر من الذكور من النوع الألبينو تم تقســـيمهم إلى مجموعتين رئيســـيتين (6 فئران بكل مجموعة). المجموعة الأولى: تغذت على الغذاء الأســـاسى. والمجموعة الثانية (42 فأر) تغذت على غذاء عالي الدهون وذلك لاحداث السـمنه بهم , والمجاميع من 3: 8 تغذت على الشـيتوكال والأعشـاب فقط وخليط منهم أيضـا بتركيز 2.5% إلى 5% . في نهاية التجربة تم قياس معدل زيادة الوزن ومعدل الاستفادة من الغذاء والمأخوذ من الغـذاء كـذلـك تم تقـدير إنزيمـات الكبـد ودهون الـدم ووظـائف الكلي والجلوكوز وصـــورة الدم الكاملة وقد أظهرت النتائج ان الســـمنة تحدث العديد من التغيرات الواضـــحة في معدل زيادة الجســـم والمؤشرات البيوكيمائية الســـابق ذكرها. وأدت معاملة الفئران البدينة بالشـــيتوكال ومخلوط الأعشـــاب إلى تحســـن ملحوظ في هذه المؤشرات وكانت أفضـــل النتائج للمجموعة التي تغذت على 5% من مخلوط الأعشاب مع الشيتوكال.

الكلمات المفتاحية: الشيتوزان، دهون الدم، إنقاص الوزن، الأعشاب، التحاليل البيوكيمائية.