Faculty of Home Economics

Journal of Home Economics
Print ISSN: 2735-5934, Online ISSN: 2735-590X
Menoufia University, Shibin El Kom, Egypt
https://mkas.journals.ekb.eg

Menoufia University

Nutrition and Food Sciences

Potential Anti-obesity Effects of Costus (*Saussurea costus*) and Bitter Melon (*Citrullus colocynthis*) in Rats Fed on High Fat Diet

Emad El-Kholie, Naglaa El Sheikh, Marwa Hassan
Department of Nutrition and Food Sciences, Faculty of Home Economics, Menoufia University, Shibin El Kom, Egypt

Abstract
Costus and Bitter melon are medicinal plants that produce a variety of chemical compounds that are useful in the treatment of various diseases, including obesity. This study aims to determine the efficacy of Costus and Bitter melon in reducing obesity in obese rats. Forty-eight male albino rats weighing 150g±10g were divided into eight groups, each with six rats. To induce obesity in rats, a high-fat diet (20 % sheep fat) was fed to them. The research also measured glucose levels, liver functions {Alanine aminotransferase (ALT) & Aspartate aminotransferase (AST)}, total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL-c), low-density lipoprotein (LDL-c), very low-density lipoprotein (VLDL-c), atherogenic index (AI) and kidney functions (urea, uric acid, and creatinine). The findings revealed that the treated groups exhibited lower glucose levels, liver functions, and kidney functions, especially when fed 5% Costus and Bitter melon, with significant differences ($P<0.05$), lowest TC and TG levels, as well as the lowest LDL-c, VLDL-c, and AI values, and vice versa in HDL-c levels. In conclusion, obese rats fed a 5% mixture of Costus, and Bitter melon powder showed improved lipid profiles, glucose levels, liver function, and renal function. Therefore, the study suggests using Costus and Bitter melon in the recommended proportions to reduce the levels of obesity in the body.

Key words: Plants, Rats, weight loss, Biochemical analysis.

Introduction
Obesity is associated with metabolic disorders. It is a medical term for a condition in which excess body fat has accumulated to the point where it is potentially hazardous to one's health, resulting in reduced life expectancy and/or increased health problems (1). It is characterized by excessive body weight and abnormal body fat accumulation and is

becoming a serious global health problem (2). It is associated with a chronic inflammatory state and other metabolic disorders such as hyperlipidemia, type 2 diabetes, cardiovascular diseases, and cancer (3). It is associated with an imbalance between energy intake and expenditure and the subsequent excess accumulation and adipogenesis of adipose tissue (4). It is a disease whose incidence has increased over the last few decades. Despite being a multifactorial disease, obesity results essentially from excessive intake of high-calorie foods associated with low physical activity. The demand for a pharmacological therapy using natural compounds as an alternative to synthetic drugs has increased (5). Adipogenesis is the process by which an undifferentiated pre-adipocyte is converted into a fully differentiated adipocyte and plays a key role in fat mass growth and the regulation of adipogenesis (6). According to (7), it is becoming one of the most common health concerns worldwide, resulting in a significant increase in mortality and morbidity from coronary heart disease, diabetes type 2, metabolic syndrome, stroke, and cancers. Researchers and physicians are rethinking their strategy in pursuit of a unique, safe, and effective therapeutic alternative for this global health concern after disappointing results following the discontinuation of lifestyle change or medication. (8) found that many natural compounds work as anti-obesity agents in various ways, reducing body weight and associated disorders. An imbalance in energy intake and expenditure because of high dietary fat consumption is the primary reason. It's characterized by a variety of lipid problems, including high TG and TC levels, low HDL-c levels, and an abnormal LDL-c composition.

Medicinal plants have and will continue to play a significant role in the treatment of obesity in the past and in the future. Medicinal plants have been used to treat ailments since ancient times. Medicinal plants utilized in the Unani system of medicine must be carefully analyzed to separate the bioactive chemicals responsible for their disease-curing activity. A wide range of medicinal herbs have anti-obesity properties (9).

Bitter melon is a Cucurbitaceae family medicinal plant endemic to tropical Asia and Africa. "Citrullus colocynthis, plants of native to desert regions, utilized in traditional medicine in Mediterranean countries as a therapy for numerous ailments, high in polyunsaturated fatty acid" (10). Bitter melon has a wide spectrum of pharmacological properties, according to (11), including antibacterial, antioxidant, anticancer, hypolipidemic, cardio-vascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic, antipyretic, and many more pharmacological actions. Citrullus colocynthis was found to contain carbohydrate, protein, separated amino acids, tannins, saponins, phenolics, flavonoids, flavone glucosides, terpenoids, alkaloids, anthranol, steroids, cucurbitacins, saponarin, cardicglycoloids, trace elements, and many other chemical groups, according to (12). Antioxidant, antibacterial, anticancer, anti-inflammatory, analgesic, gastrointestinal, reproductive, protecting, and many other

pharmacological actions were found in it. Colocynth, bitter apple, bitter cucumber, bitter melon, desert gourd, egusi, vine of Sodom, or wild gourd are some of the common names for Citrullus colocynthis. (13) reported that carbohydrate, protein, separated amino acids, tannins, saponins, phenolic, flavanoids, terpenoids, alkaloids, anthranol, steroids, Cucurbitacin A, B, C, D, E (-elaterin), J, L, caffeic acid, and cardicglycoloids were found in bitter cucumber phytochemical analysis. (14) found that when animals were given 4% bitter melon (Citrullus colocynthis) oil as part of their food plan for 8 weeks, they demonstrated a significant decrease in body weight gain when compared to animals given 4% sunflower oil. Furthermore, therapy with Colocynth oil isolated from bitter cucumber reduced serum cholesterol, triglycerides, and ALP levels. These findings back up the use of bitter cucumber oil as a treatment for dyslipidemia, hyperglycemia, and other metabolic disorders.

Costus (Saussurea costus), often known as costus or kuth, is an Indian thistle species in the Saussurea genus. The root of the plant Saussurea costus is Aucklandia, often known as costus or Mu Xiang. The plant's root is the most important portion for medicinal or homoeopathic uses (15). Costus has been shown to contain flavonoids and sesquiterpene, among other phytochemical elements. PTPases are known to be a negative regulator of insulin signal transduction by dephosphorylating both the insulin receptor (IR) and its substrate, insulin receptor substrates. As a result, PTP1B inhibitors are being considered as potential therapeutic agents for type 2 diabetes and obesity (16). Costus is rich in antioxidants and has anti-hepatotoxic, anti-diabetic, antifungal, anthelmintic, anti-tumour, anti-inflammatory, anti-ulcer, antimicrobial, and immunostimulant effects (17).

(18) found that costunolide extracted from Costus sp. has a hypoglycemic and hypolipidemic impact in streptozotocin-induced diabetic rats, lowering plasma total lipid, cholesterol, and triglyceride while improving hepatic antioxidant enzyme activities. (19) conducted research on the effects of Costus on atherosclerotic male rabbits. As a result of its significant antioxidant qualities, the Costus rhizome could be used to treat hyperlipidemia and myocardial infarction.

The goal of this study was to determine how different doses of Costus, Bitter melon, and their powder mixture affected the biological and biochemical complications of obese rats.

Material and Methods

Materials:

Costus, Bitter melon were obtained from Haraz herbalist, Cairo Governorate, Egypt.

Experimental animals

Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt provided a total of 48 adult normal male albino rats "Sprague Dawley" strain weighing 150±10 g.

The chemicals and kits

Morgan Co. Cairo, Egypt provided casein, cellulose, choline chloride powder, and DL methionine powder. Al-Gomhoria Company for Trading Drugs, Chemical and Medical Instruments, Cairo, Egypt, provided the chemical kits (TC, TG, HDL-c, ALT, AST, ALP, urea, uric acid and creatinine) utilized in this examination.

Methods

Preparations of Costus and Bitter melon

The Costus and Bitter melon were ground to a fine powder in an air mill, then mixed with a high-speed mixer and served as powder seize.

The induction of obesity

Obesity was inducing in normal healthy male albino rats by fed on high fat diet (20% sheep fat) supplemented in the basal diet and used as a positive control group according to (20).

Experimental design

The study was carried out at Animal House, Faculty of Home Economics, Menoufia University, Egypt.

In this experiment, 48 adult male albino rats, "Sprague Dawley", weighing (150±10g), were used. All groups of rats were fed the (21) for 7 days prepared standard diet. After this adaptation period, rats were divided into 8 groups, six rats per each as follows: group (1): Rats fed on basal diet only as negative control. Group (2): Obese rats induced by fed on high fat diet (20% sheep fat) fed on basil diet only as a positive control group. Group (3): A group obese rats fed on basal diet and Costus as powder by 2.5% of the weight of basil diet. Group (4): A group obese rats fed on basal diet and Costus as powder by 5% of the weight of basil diet. Group (5): A group obese rats fed on basal diet and Bitter melon as powder by 2.5% of the weight of basil diet. Group (6): A group obese rats fed on basal diet and Bitter melon as powder by 5% of the weight of basil diet. Group (7): A group obese rats fed on basal diet and mixture (1:1) as powder of Costus and Bitter melon as powder by 2.5% of the weight of basil diet. Group (8): A group obese rats fed on basal diet and mixture (1:1) as powder of Costus and Bitter melon by 5% of the weight of basil diet. The experiment continued for 28 days, at the end of the experimental period each rat weight separately, then slaughtered and blood samples were collected.

Blood sampling

At the end of the experiment period, rats were fasted for 12-h then rats were scarified. Blood samples were collected from the portal vein into dry clean centrifuge tubes for serum separation, blood samples centrifuged for 10 minutes at 4000 rpm to separate, the serum according to (22). Serum samples were frozen at -18 °C until chemical analysis.

Biochemical analysis

Total cholesterol, Triglycerides (T.G), High Density Lipoprotein (H.D.L- c), Low Density Lipoprotein (L.D.L-c), and Very Low Lipoprotein (V.L.D-c) and atherogenic index (AI) was determined according to (23), (24), (25), (26) and (27).

Alanine amino transferase (ALT) activities were measured in serum using the modified kinetic method of (28). Aspartate amino transferase (AST) activities were measured in serum using the modified kinetic method of (29), serum alkaline phosphatase (ALP) was carried out according to the method of (30).

Enzymatic determination of Serum glucose was carried out calorimetrically according to the method of (31). Serum uric acid, serum urea and serum creatinine were determined by enzymatic method according to (32, 33 and 34).

Statistical analysis:

The data were analyzed using a completely randomized factorial design SAS (35) when a significant main effect was detected; the means were separated with the Student-Newman-Keuls Test. Differences between treatments of ($P<0.05$) were considered significant using Costat Program. Biological results were analyzed by One Way ANOVA.

Results And Discussion

The effects of Costus, Bitter melon and their mixture powders on serum total cholesterol and serum triglycerides levels in obese rats are shown in Table (1). The acquired data revealed that the positive control group had the highest serum total cholesterol levels, while the negative control group had the lowest, with significant differences ($P<0.05$), which were 155.50 mg/dl and 90.00 mg/dl, respectively, On the other hand, 2.5 % Costus roots had the highest serum total cholesterol levels in obese groups, whereas 5 % mixture had the lowest, with significant differences ($P<0.05$). The average values were 124.00 and 107.50 mg/dl.

In terms of serum triglycerides levels, it can be stated that the positive control group had the highest serum triglycerides levels, while the negative control group had the lowest, with significant differences ($P<0.05$). The mean values were 135.00 and 65.00 mg/dl, respectively. On the other hand, 2.5 % Bitter melon had the highest serum triglyceride levels in obese groups, whereas 5 % mixture had the lowest, with significant differences ($P<0.05$), which were 111.00 and 77.50 mg/dl, respectively. These findings are consistent with those of (18) who stated that costunolide, a hypolipidemic medication derived from Costus, was found to dramatically lower plasma TC, TG, and LDL levels in rats when given at a dose of 20 mg/kg body weight. The presence of phytochemicals in Costus rhizomes may explain their hypocholesterolemia action (36).

Table (1): Effect of Costus, Bitter melon and their mixture on total cholesterol and triglycerides of obese rats

Parameter Groups	Total cholesterol (mg /dl)	Triglycerides (mg /dl)
Control negative	90.00±1.15f	65.00±1.11h
Control positive	155.50±1.14a	135.00±1.14a
Obese rats +2.5 % Costus	124.00±1.16b	107.50±1.13c
Obese rats +5 % Costus	118.00±1.13c	93.00±1.15e
Obese rats +2.5 %Bitter melon	119.50±1.14c	111.00±1.12b
Obese rats +5 %Bitter melon	120.00±1.12c	99.00±1.11d
Obese rats +2.5% Mixture	114.00±1.15d	81.00±1.13f
Obese rats +5% Mixture	107.50±1.13e	77.50±1.16g
LSD (P< 0.05)	3.650	3.382

Each value is represented as Values are expressed as mean ± SD; means in the same raw with different letter are significantly different (P<0.05).

Table (2) shows the effects of different levels of Costus, Bitter melon, and their mixture on the lipid profile (HDL-c, LDL-c, VLDL-c, and AI)) in obese rats. The collected data revealed that the negative control group had the highest levels of HDL-c, while the positive control group had the lowest, with significant differences (P<0.05). The average concentrations were 51.00 and 33.50 mg/dl, respectively. On the other hand, 5 % mixture had the greatest levels of HDL-c in obese groups, whereas 2.5 % Costus had the lowest, with significant differences (P<0.05), which were 45.10 and 34.00 mg/dl, respectively.

The highest levels of LDL-c were found in the positive control group, whereas the lowest were found in the negative control group, with significant differences (P<0.05). The average LDL-c levels were 95.00 and 25.00 mg/dl, respectively. On the other hand, 2.5% Costus had the greatest levels of LDL-c in obese groups, whereas 5% mixture had the lowest, with significant differences (P<0.05). The average concentrations were 68.50 and 46.90 mg/dl, respectively.

In terms of very low-density lipoprotein cholesterol (VLDL-c) levels, it can be stated that the positive control group had the highest VLDL-c levels, while the negative control group had the lowest, with significant differences (P<0.05). The average readings were 27.00 and 13.00 mg/dl, respectively. On the other hand, 2.5 % Bitter melon had the greatest VLDL-c levels of obese groups, whereas 5 % mixture had the lowest, with significant differences (P<0.05), which were 22.20 and 15.50 mg/dl, respectively.

As for atherogenic index (AI), data indicated that the positive control group had the highest VLDL-c levels, while the negative control group had the lowest, with significant differences (P<0.05). The average readings were 3.64 and 0.76 mg/dl, respectively. On the other hand, 2.5 % Costus had the greatest AI levels of obese groups, whereas 5 %

mixture had the lowest, with significant differences (P<0.05), which were 2.65 and 1.38 mg/dl, respectively. It was concluded that 5 % mixture has been the most effective treatment, resulting in the greatest drop in lipid profile levels. These findings are consistent with those of (37) who investigated the biochemical components of bitter melon that have an anti-obesity impact and their mechanisms of action. We also confirmed the function and synergistic effects of various bitter melon components, as well as a description of the further processing steps that could lead to widespread bitter melon use. (38) found that Costus lappa had anti-obesity properties in 3T3-L1 adipocytes and obese mice fed a high-fat diet. As a result, Costus could be a promising option for treating obesity or assisting in the development of new anti-obesity medications.

Table (2): Effect of Costus, Bitter melon and their mixture on lipid profile of obese rats

Parameter Groups	HDL-c (mg /dl)	LDL-c (mg /dl)	VLDL-c (mg /dl)	AI (%)
Control negative	51.00±1.15a	26.00±1.10f	13.00±1.12d	0.76±0.10e
Control positive	33.50±1.13e	95.00±1.16a	27.00±1.15a	3.64±0.14a
Obese rats +2.5 % Costus	34.00±1.10e	68.50±1.14b	21.50±1.13b	2.65±0.15a
Obese rats +5 % Costus	40.30±1.13c	59.10±1.14c	18.60±1.12c	1.93±0.13d
Obese rats +2.5 %Bitter melon	37.00±1.13d	60.30±1.15c	22.20±1.10b	2.23±0.16c
Obese rats +5 %Bitter melon	39.00±1.11c	61.20±1.13c	19.80±1.13b	2.08±0.15c
Obese rats +2.5% Mixture	43.50±1.14b	54.30±1.15d	16.20±1.11c	1.62±0.14d
Obese rats +5% Mixture	45.10±1.14b	46.90±1.12e	15.50±1.15cd	1.38±0.12d
LSD (P < 0.05)	2.961	3.600	2.761	0.285

Each value is represented as Values are expressed as mean ± SD; means in the same raw with different letter are significantly different (P<0.05).

The effect of various levels of Costus, Bitter melon and their mixture on obese rats' glucose levels is shown in Table (3). The acquired data revealed that the positive control group had a higher glucose level, whereas the negative control group had a lower level, with a significant difference (P<0.05). The average blood glucose levels were 188.5 mg/dl and 110.0 mg/dl, respectively.

On the other hand, rats fed 5% mixture, had the lowest glucose levels, with a significant difference (P<0.05) when compared to the control positive group, being 120.50 mg/dl. While rats fed 2.5% Costus had the highest glucose level in obese rats being 153.50 mg/dl, with a significant difference (P<0.05) when compared to the control positive group. It was concluded that 5 % mixture has been the most effective treatment, resulting in the greatest drop in glucose levels. These findings are in line with those of (39), who discovered that the Costus colocynthis fruit has insulin-boosting properties. This activity could account for some of its anti-diabetic properties in traditional medicine. It also finds

the Costus colocynthis as a potential source of a novel insulin enhancer that could help type 2 diabetics lower hyperglycemia. Also, according to (40) the hypoglycemic effect of the hydro-ethanolic extract of Costus colocynthis pulpy flesh with seeds could be attributable to the probable inhibition of -glucosidase.

Table (3): Effect of Costus, Bitter melon and their mixture on blood glucose of obese rats

Groups	Blood glucose (mg/dl)
Control negative	110.0±1.11f
Control positive	188.50±1.16a
Obese rats +2.5 % Costus	153.50±1.14b
Obese rats +5 % Costus	139.50±1.14c
Obese rats +2.5 %Bitter melon	136.00±1.12c
Obese rats +5 %Bitter melon	129.00±1.11d
Obese rats +2.5%Mixture	126.50±1.10d
Obese rats +5%Mixture	120.50±1.12e
LSD (P < 0.05)	5.123

Each value is represented as Values are expressed as means ± SD; means in the same raw with different letter are significantly different (P < 0.05).

Table (4) shows the effect of Costus, Bitter melon and their mixture powders on the levels of liver functions (ALT, AST, and ALP) in obese rats. The positive control group had the highest levels of ALT liver enzymes, whereas the negative control group had the lowest, with significant differences (P<0.05), the average values were 90.50 and 35.20 U/L were, respectively. The highest ALT liver enzyme of treated groups was recorded for 2.5 % Costus, while the lowest value was found for 5 percent mixture, with average values of 75.00 and 39.50 U/L, respectively, with significant differences (P<0.05).

The positive control group had the highest levels of the AST liver enzyme, whereas the negative control group had the lowest, with significant differences (P<0.05), which were 83.50 and 55.50 U/L, respectively. The highest AST liver enzyme of treated groups was recorded for 2.5 % Bitter melon, while the lowest value was seen for 5 % mixture, with significant differences (P<0.05), which were 76.50 and 58.50 U/L, respectively.

In terms of LAP liver enzyme, the positive control group had the highest levels, while the negative control group had the lowest, with significant differences (P<0.05), which were 82.13 and 39.90 U/L, respectively. On the other hand, with significant differences (P<0.05), the highest ALP liver enzyme of treated groups was recorded for 2.5 % Bitter melon, while the lowest value was observed for 5 % mixture, which were 69.70 and 43.00 U/L, respectively. These results are in agree with (41) who discovered that the Citrullus colocynthis fruits seeds extract had a protective effect in avoiding the onset of fatty liver syndrome.

Table (4) Effect of Costus, Bitter melon and their mixture on liver functions of obese rats

Parameter Groups	ALT (U/L)	AST (U/L)	ALP (U/L)
Control negative	35.20h±1.25	55.50f ±0.80	39.90g±1.10
Control positive	90.50a±1.13	83.50a±1.40	82.13a±1.13
Obese rats + 2.5 % Costus	75.00b±1.20	70.50c ±1.20	68.80b±1.15
Obese rats + 5 % Costus	67.00d±1.15	63.50d ±0.90	59.03c±1.21
Obese rats + 2.5 %Bitter melon	69.50c±1.10	76.50b ±0.80	69.70b±1.14
Obese rats +5 %Bitter melon	54.50e±1.23	74.50b ±0.60	56.74d±1.16
Obese rats + 2.5% Mixture	42.40f±1.14	63.50d ±0.40	48.60e±1.40
Obese rats + 5% Mixture	39.50g±1.15	58.50e±0.50	43.00f±1.15
LSD ($P < 0.05$)	2.144	2.502	2.046

Each value is represented as Values are expressed as means ± SD; means in the same raw with different letter are significantly different ($P < 0.05$).

Table (5) shows the effects of Costus, Bitter Melon, and their mixture powders on renal function (serum urea, serum uric acid, and serum creatinine) in obese rats. The negative control group had the highest serum urea levels, whereas the positive control group had the lowest, with significant differences ($P<0.05$) between the two groups. The average readings were 48.70 and 26.60 mg/dl, respectively. On the other hand, with significant differences ($P<0.05$), the greatest values were recorded for 2.5 % Bitter melon, while the lowest value was reported for 5 % mixture, which were 40.60 and 29.00 mg/dl, respectively.

The positive control group had the highest serum uric acid levels, whereas the negative control group had the lowest, with significant differences ($P<0.05$) between the two groups. which were 3.50 and 1.80 mg/dl, respectively. 2.5 % Costus had the greatest blood uric acid levels, while 5 percent mixture had the lowest, with significant differences ($P<0.05$), in serum uric acid levels. which were 2.90 and 1.85 mg/dl, respectively.

In terms of serum creatinine, the acquired data revealed that the positive control group had the highest levels, while the negative control group had the lowest, with significant differences ($P<0.05$). The mean values were 2.50 and 0.80 mg/dl, respectively. On the other hand, 2.5 % Costus had the highest serum creatinine levels, whereas 5 % mixture had the lowest, with significant differences ($P<0.05$). The mean values were 1.31 and 0.91 mg/dl, respectively. These findings are in line with those of (42), who discovered that the medicinal plant Citrullus colocynthis fruit can protect kidney functions and tissues. As a result, it may help to avoid nephropathy.

In addition, (43) found that non-treated diabetic rats had greater blood urea, uric acid, and creatinine levels than the control group. After being treated with Citrullus colocynthis, the levels of these kidney functions decreased, possibly indicating that this extract could improve renal function.

Table (5): Effect of Costus, Bitter cucumber and their mixture on kidney functions of obese rats

Parameter / Groups	Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
Control negative	26.60±1.10g	1.80±1.15c	0.80±1.10d
Control positive	48.70±1.12a	3.50±1.11a	2.50±1.13a
Obese rats + 2.5 % Costus	37.70±1.11c	2.90±1.14a	1.31±1.11b
Obese rats + 5 % Costus	31.70±1.13e	2.60±1.10a	1.16±1.10b
Obese rats + 2.5 %Bitter melon	40.60±1.12b	2.85±1.14a	1.59±1.12b
Obese rats +5 %Bitter melon	35.00±1.10d	2.45±1.13a	1.03±1.14c
Obese rats + 2.5% Mixture	30.60±1.14e	1.92±1.13b	0.97±1.13c
Obese rats + 5% Mixture	29.00±1.15f	1.85±1.11b	0.91±1.15c
LSD ($P < 0.05$)	1.653	1.140	0.501

Each value is represented as Values are expressed as means ± SD; means in the same raw with different letter are significantly different ($P < 0.05$).

Conclusion

Obese rats fed Costus and Bitter melon powder exhibited improved serum lipid profiles, glucose levels, liver, and kidney function, especially at a concentration of 5% mixture.

References

[1] Etymology Dictionary Obesity. Douglas Harper.18. Physical Status: The Use and Interpretation of Anthropometry, (2001), WHO Technical Report Series, 854: 9.

[2] Chang, H.C.; Yang, H.C.; Chang, H.Y. and Yeh, C.J. Morbid obesity in Taiwan: Prevalence, trends, associated social demographics, and lifestyle factors. PLoS One. (2017); 12: e 0169577.

[3] Han, T.S. and Lean, M.E. A clinical perspective of obesity, metabolic syndrome, and cardiovascular disease. JRSM Cardiovasc. Dis., (2016); 5: 1-13.

[4] Jung, U.J. and Choi, M.S. Obesity, and its metabolic complications: the role of adipokines and the relationship between obesity, inflammation, insulin resistance, dyslipidemia and nonalcoholic fatty liver disease. Int J Mol Sci., (2014); 15: 6184-6223.

[5] Martins, T.; Ferreira, T.; Nascimento-Gonçalves, E. and Castro-Ribeiro, C. Obesity Rodent Models Applied to Research with Food Products and Natural Compounds. Obesities, (2022); 2, 171-204.

[6] Yang, J.W. and Kim, S.S. GinsenosideRc promotes anti-adipogenic activity on 3T3-L1 adipocytes by down-regulating C/EBP alpha and PPARgamma. Molecules, (2015); 20:1293-1303.
[7] Hassan, H.A. and El-Gharib, N.E. Obesity and clinical riskiness relationship: Therapeutic management by dietary antioxidant supplementation-a review. Appl. Biochem. Biotechnol., (2015); 175 (8), 1-19.
[8] Repas, T. Obesity, and dyslipidemia. South Dakota Medicine, (2011); 64: 241-247.
[9] Akram, M. Anti-Obesity Activity of Medicinal Plants: A Review. Diabetic Complications. www.smgebooks.com, (2017); 1-13.
[10] Delphanque B.; Le-roy, B.; Mendy, F. and Fenart, E. Oléagineux, corps gras, Lipides. (2002); 9: 237-243.
[11] Al-Snafi, A.E. Therapeutic properties of medicinal plants: a review of their detoxification capacity and protective effects (part 1). Asian Journal of Pharmaceutical Science & Technology, (2015); 5 (4): 257-270.
[12] Al-Snafi, A.E. Chemical constituents and pharmacological effects of Clerodendrum inerme- A review. SMU Medical Journal, (2016); 3 (1): 129-153.
[13] Jayaraman, R. and Christina, A.J.M. Evaluation of Citrullus colocynthis fruits on in vitro antioxidant activity and in vivo DEN/PB induced hepatotoxicity. International Journal of Applied Research in Natural Products, (2013); 6 (1): 1-9.
[14] Amamou, F.; Bouafia, M.; Chabane-Sari, D.; Meziane, R.K. and Nani, A. Citrullus colocynthis: a desert plant native in Algeria, effects of fixed oil on blood homeostasis in Wistar rat. J. Nat. Prod. Plant Resour., (2011); 1 (3):1-7.
[15] Lohberger, B.; BeateRinner, B.; Stuendl, N. and Kaltenegger, H. Sesquiterpene lactones downregulate G2/M cell cycle regulator proteins and affect the invasive potential of human soft tissue sarcoma cells. Plos. ONE. (2013); 8 (6): e66300.
[16] Akhtar, M.S.; Bashir, S.; Nasir, M.; Malik, H. and Manzoor, R. Cardiotonic activity of methanolic extract of Saussurea lappa, Linn roots Pak. J. Pharm. Sci., (2013); 26 (6): P.1197-1201.
[17] Nadda, R.K.; Ali, A.; Goyal, R.C. and Khosla, P.K. Aucklandia costus (Syn. Saussurea costus): Ethnopharmacology of an Endangered Medicinal Plant of the Himalayan Region. J. Ethnopharmacology, (2020); 263, 113199.
[18] Eliza, J.; Daisy, P.; Ignacimuthu, S. and Duraipandiyan, V. Normo-glycemic and hypolipidemic effect of costunolide isolated from Costus speciosus (Koen ex. Retz.) Sm. in streptozotocin-induced diabetic rats. Chemico-Biological Interaction, (2009); 179: 329-334.
[19] Shediwah, F.M.H.; Naji, K.M.; Gumaih, H.S. and Alhadi, F.A. Antioxidant and antihyperlipidemic activity of Costus Speciosus against atherogenic diet-induced hyperlipidemia in rabbits. J. Integr. Med., (2019); 17 (3): 181-191.

[20] Moss, D.W. Alkaline phosphatase isoenzymes. Clin. Chem., (1982); 28: 2007-2016.
[21] Reeves, P.G.; Nielsen, F.H. and Fahmy, G.C. Reported of the American Institute of Nutrition adhocwriling committee on the reformulation of the AIN -76 a Rodent diet. Journal Nutrition, (1993); 123:1939-19351.
[22] Schermer, S. The Blood Morphology of Laboratory Animal. Longmans Printed in Great Britain, (1967); Green and Co. Ltd, p. 350.
[23] Allain, C.C. Cholesterol enzymatic colorimetric method. J. of Clin. Chem., (1974); 20: 470.
[24] Fossati, P. and Prencipe, L. Triglyceride enzymatic colorimetric method. J. of Clin. Chem., (1982); (28): 2077.
[25] Lopez, M.F. HDL- cholesterol colorimetric method. J. of Clin. Chem., (1977); 230: 282.
[26] Lee, R. and Nieman, D. National Assessment. 2nd Ed., Mosby, Missouri, (1996); USA.
[27] Kikuchi-Hayakawa; Onodera, N.; Matsubara, S.; Yasudo, E.; Chonan, O.; Takahashi, R. and Ishikawa, F. Effect of soymilk and bifido-bacterium fermented soymilk on lipid metabolism in aged ovariectomized rats. Bioscience Biotechnology and Biochemistry, (1998); 62 (9): 1688-1692.
[28] Hafkenscheid, J.C. Determination of GOT. Clin. Chem. (1979); 25: 155.
[29] Henary, R.J. Clinical Chemist: Principals and Techniques. 2nd, Edition, Hagerstoun (MD), (1974); Harcer, ROW, P. 882.
[30] Belfied, A. and Goldberg, D.M. Alkaline phosphatase colorimetric method. J. of Enzyme, (1971); (12): 561.
[31] Wang, Z.; Yuexin, Y.; Xiang, X. and Zhu, Y. Estimation of the normal range of blood glucose in rats. Journal of hygiene research, (2010); 39 (2):133-142.
[32] Barham, D. and Trinder, P. Determination of uric acid. Analyst, (1972); 97: 142.
[33] Henry, R.J. Clinical Chemist: Principles and Techniques, 2nd Edition, Hagerstoun (MD), (1974); Harcer, ROW, 882.
[34] Patton, C.J. and Crouch, S.R. Enzymatic determination of urea. J. of Anal. Chem., (1977); 49: 464-469.
[35] SAS. SAS Users Guide: Statistics version 5th Ed. SAS. Institute Inc., (1988); Cary N.C.
[36] Jha, M.K.; Alam, M.B.; Hossain, M.S. and Islam, A. In vitro antioxidant and cytotoxic potential of Costus speciosus (Koen.) Smith rhizome. Int. J. Pharm. Sci. Res., (2010);1 (10):138-44.
[37] Fan, M.; Kim, E.; Choi, Y. and Tang, Y. The role of Momordica charantia in resisting obesity. International Journal of Environmental Research and Public Health, (2019); (16): 1-16.

[38] Yoon, T.S.; Sung, Y.Y.; Jang, J.Y. and Yang, W.K. Anti-obesity Activity of Extract from Saussurea lappa. Korean J. Medicinal Crop Sci., (2010); 18 (3): 151-156.
[39] Drissi, F.; Lahfa, F.; Gonzalez, T. and Peiretti, F. A Citrullus colocynthis fruit extract acutely enhances insulin induced GLUT4 translocation and glucose uptake in adipocytes by increasing PKB phosphorylation. Journal of Ethnopharmacology, (2021); 270, (24): 1-6.
[40] Ghauri, A.O.; Saeed Ahmad, S. and Tayyeba Rehman, T. In vitro and in vivo anti-diabetic activity of Citrullus colocynths pulpy flesh with seeds hydro-ethanolic extract. Journal of Complementary and Integrative Medicine, (2020); (23): 2018-2028.
[41] Esmail, E.O.A. Possible protective effect of Citrullus colocynthis melon against diabetes mellitus type-2 associated with non-alcoholic fatty liver syndrome in rats. J. Am. Sci., (2012); 8: 1054-1061.
[42] Abd El-Baky, A.E. and Amin, H.K. Effect of Citrullus colocynthis in ameliorate the oxidative stress and nephropathy in diabetic experimental rats. International Journal of Pharmaceutical Studies and Research, (2011); 2 (2): 1-10.
[43] Mohammad D.; Nabil B.; Mohammad A. and Elessa, R. Concomitant Down Regulation of Glycolytic Enzymes, Upregulation of Gluconeogenic Enzymes and Potential Hepato Nephro-Protective Effects Following the Chronic Administration of the Hypoglycemic, Insulinotropic Citrullus colocynthis Pulp Extract. American Journal of Biochemistry and Biotechnology, (2009); 5 (4): 153-161.

التأثيرات المحتملة المضادة للسمنة للقسط الهندى والحنظل في الفئران المغداة على نظام غذائي غني بالدهون

عماد الخولى، نجلاء الشيخ، مروة حسن
قسم التغذية وعلوم الأطعمة، كلية الاقتصاد المنزلي، جامعة المنوفية، شبين الكوم، مصر

الملخص العربي:

يعتبر القسط الهندى والحنظل من النباتات الطبية التي تنتج مجموعة متنوعة من المركبات الكيميائية المفيدة في علاج مجموعة متنوعة من الأمراض ، بما في ذلك السمنة. الهدف من هذه الدراسة هو تحديد مدى فاعلية القسط الهندى والحنظل في تقليل السمنة لدى الفئران البدينة. تم تقسيم ٤٨ من ذكور الفئران البيضاء وزنها ١٥٠ جم ± ١٠ جم إلى ٨ مجموعات ، كل منها ستة فئران. للحث على السمنة في الفئران ، تم تغذيتهم على نظام غذائي عالي الدهون (٢٠ ٪ دهن الأغنام). أيضًا تم قياس مستويات الجلوكوز ووظائف الكبد (ALP،AST، ALT) والكوليسترول الكلي والدهون الثلاثية والبروتين الدهني عالي الكثافة والبروتين الدهني منخفض الكثافة والبروتين الدهني منخفض الكثافة جدا ومؤشر تصلب الشرايين ووظائف الكلى (اليوريا وحمض اليوريك والكرياتينين) .أظهرت النتائج أن المجموعات المعالجة أظهرت انخفاضًا في مستويات الجلوكوز ووظائف الكبد ووظائف الكلى ، خاصة عند التغذية بنسبة 5٪ من القسط الهندى والحنظل ، مع وجود فرق معنوي ($P<0.05$). كما سجلت مجاميع الفئران المغذاة على القسط الهندى والحنظل على أقل مستويات الكوليسترول والدهون الثلاثية ، بالإضافة إلى أقل مستويات البروتين الدهني منخفض الكثافة ، والبروتين الدهني منخفض الكثافة جدا و مؤشر تصلب الشرايين مع وجود فروق معنوية. والعكس بالعكس في مستويات البروتين الدهني عالي الكثافة. في الختام ، أظهرت الفئران البدينة التي تم تغذيتها على خليط بنسبة 5٪ من مسحوق القسط الهندى والحنظل تحسن في مستوى الدهون ومستويات الجلوكوز ووظائف الكبد ووظائف الكلى. لذا توصى الدراسة بإمكانية استخدام القسط الهندى والحنظل بالنسب الموصى بها لتقليل مستويات السمنة بالجسم.

الكلمات الأفتتاحية: النباتات , الفئران , خفض الوزن , التحاليل الكيميائية الحيوية.